8 FEBRUARY 1952 ONE SHILLING

FLIGHT
and
AIRCRAFT ENGINEER

OFFICIAL ORGAN OF THE ROYAL AERO CLUB

DOCKS IN ADVANCE

However remote the destination, the Princess will be able to disembark her troops at Saunders-Roe portable pontoon docks flown out a few hours in advance.

(*Buoyancy by Dunlop*)

SAUNDERS-ROE LTD

WORKS: EAST COWES, ISLE OF WIGHT · EASTLEIGH, SOUTHAMPTON AND BEAUMARIS, ANGLESEY.

DOWTY Equipment

TYPE 4600 - Y
PATENTS PENDING

The 'HYDEL'
ELECTRO-HYDRAULIC
Four-Way SELECTOR VALVE

A solenoid operated slide valve weighing 2.5 lb. suitable for high rates of flow, rapid response, and pressures up to 4,000 pounds per square inch.

DOWTY EQUIPMENT LIMITED · CHELTENHAM

FIRTH BROWN 1837–1952

EXPERIENCE & DEVELOPMENT IN HIGHEST QUALITY STEELS OF ALL GRADES

As manufacturers of Alloy Steels for High Duty, Firth Brown's contribution to industry is world wide, whether it be steels for engineering, ship-building, automobile, aircraft, road and rail transport or for the most minute mechanisms of the precision engineering industries. Firth Brown steels are used for parts of the Vickers Viscount 700, built by Vickers-Armstrongs Limited.

LIST OF PRODUCTS

Forgings—Light and Heavy for special and general engineering.

Forged Steel Drums and Pressure Vessels.

Hardened Steel Rolls.

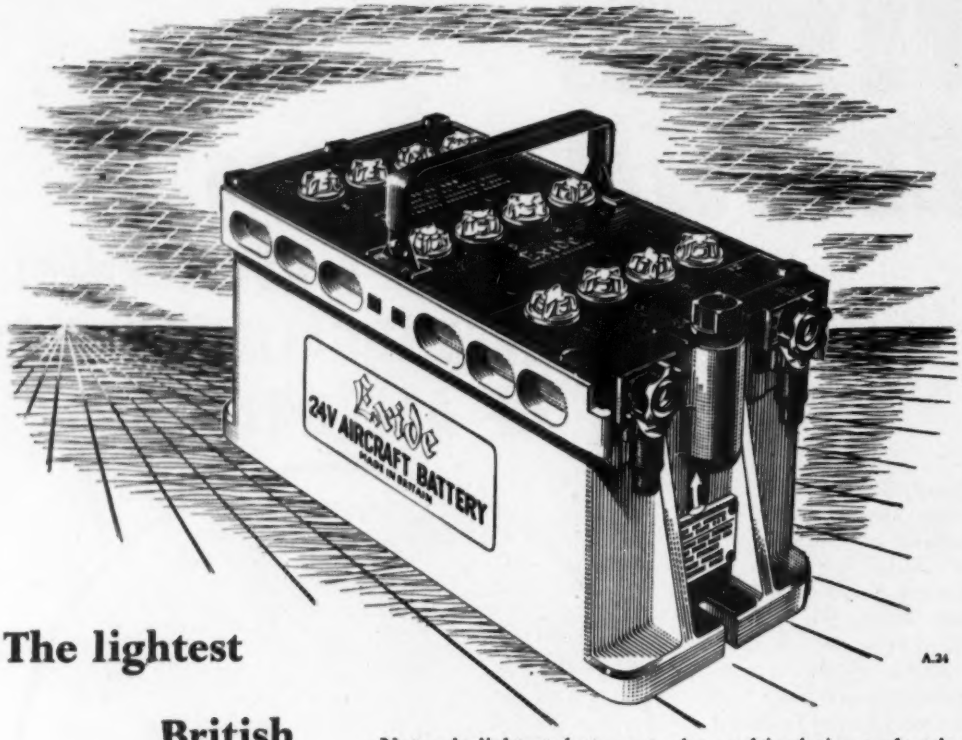
Carbon and Alloy Steel Bars and Billets.

Tyres and Rings.

High Speed and Tool and Die Steels.

Steel Castings.

THOS. FIRTH & JOHN BROWN LTD., SHEFFIELD



A.24

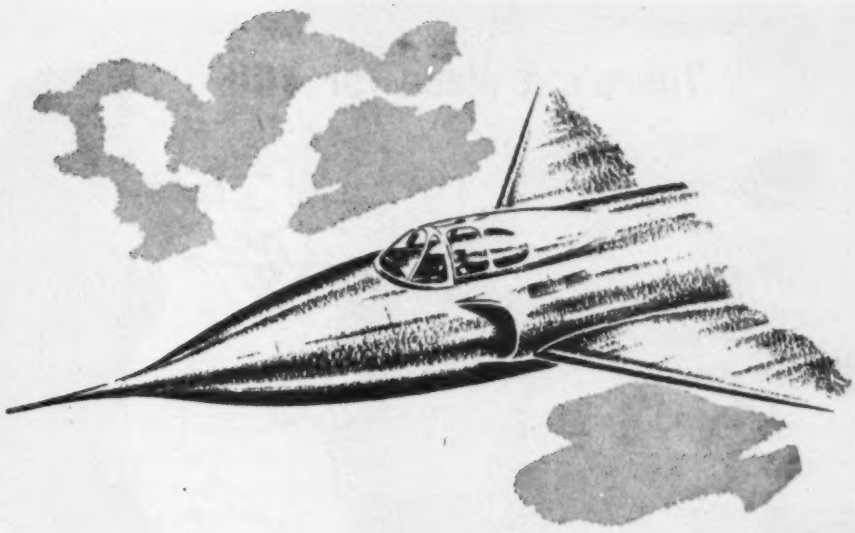
The lightest British civil aircraft battery of its voltage and capacity

Not only lightest, but most advanced in design & electrical performance. One-piece container of tough, acid-proof, shock-resistant plastic. Quick-release fully-polarised terminals. Simple two-point fixing. Easy control of electrolyte level. Ribbed microporous P.V.C. separators. Long-life plates. High output for engine starting.

Exide AIRCRAFT BATTERY

24 V. 15 Ah. 32½ lb. — 24 V. 25 Ah. 43½ lb.

A PRODUCT OF CHLORIDE BATTERIES LIMITED · EXIDE WORKS: CLIFTON JUNCTION: NEAR MANCHESTER



It's only HALF a Fighter . . .

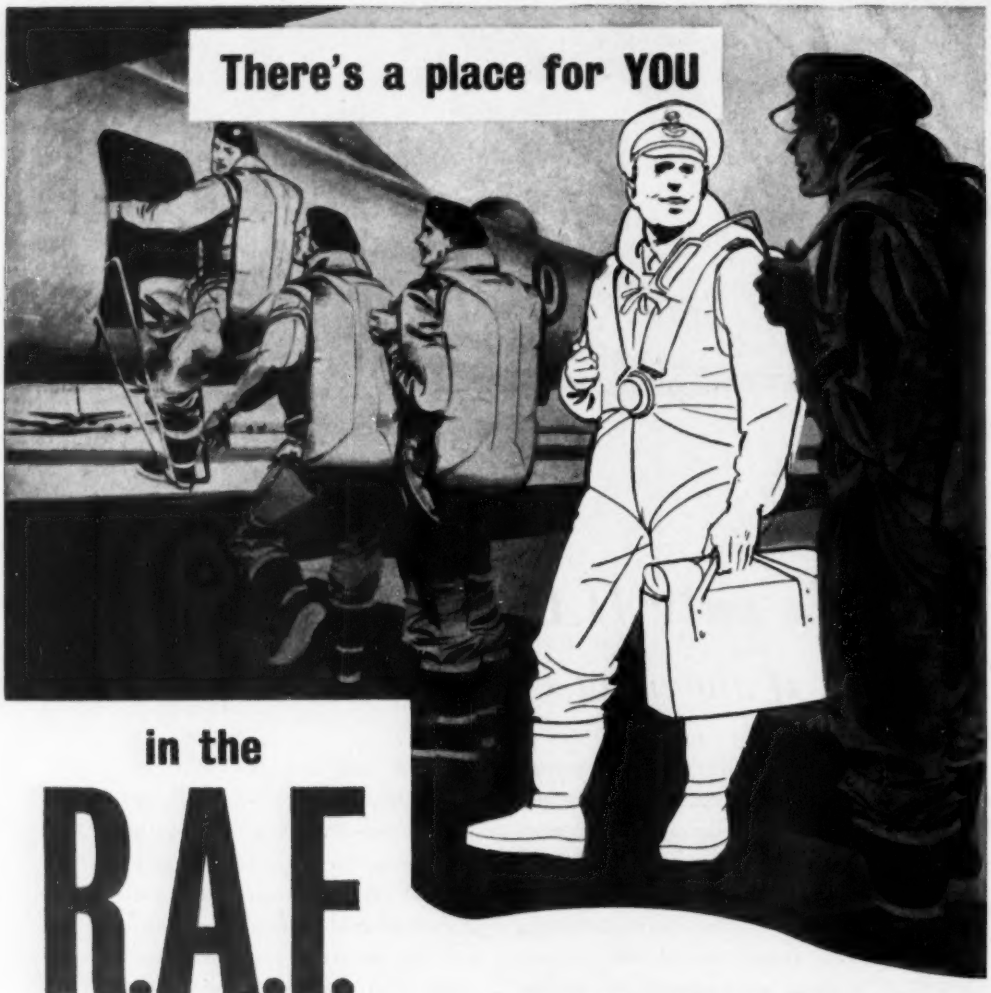
if the pilot's efficiency is impaired

Fighter efficiency depends on **pilot** efficiency . . . and one of the factors upon which the efficiency of the pilot depends is the cabin air conditioning. Fully automatic, inherently reliable and sensitive under all conditions, the new Teddington Band Temperature Controller has been designed and engineered to meet the requirements of the modern military aircraft. The Band Control uses a highly sensitive pick-off of very small size which can be installed in a wide variety of forms, some capable of sensing highly localised temperature levels such as metal bond layers. The power servo is purely electrical, using no thermionic valves, and a simple electrical feed-back ensures that, even with systems having high thermal capacities and the associated thermal lags, no hunting is experienced. This is but one item in the wide range of Teddington units which covers almost every control problem.

Teddington

TEDDINGTON CONTROLS LTD., CEFN COED, MERTHYR TYDFIL, SOUTH WALES. Merthyr Tydfil 666

770



in the

R.A.F.

Careers which guarantee an exciting future are few and far between. When you add to this unusually good pay, an outdoor life and the satisfaction that comes from doing a job that matters you have summed up the things that so many men ask for and which the Royal Air Force gives. To-day men are urgently needed to fly in the R.A.F.'s newly formed squadrons. Those selected for Pilot or Navigator under the new Aircrew scheme are commissioned on the successful completion of their initial training. You can enlist on short engagements of 4 or 8 years carrying attractive gratuities of up to £1,500. If you stay on as a Regular there's no reason why, after 8 years' service, you should not be earning over £1,000 a year (including marriage allowance). Ask yourself how many civilian jobs pay so well. Then write for the free leaflet about life in the Royal Air Force either for National Service or as a career.

TO: ROYAL AIR FORCE (F.R.32.), VICTORY HOUSE, LONDON, W.C.2.
Please send details of life in the R.A.F.

(A) In the Air ☐ (B) On the Ground ☐ (*Tick which you require*)

SEND NOW FOR LEAFLET!

NAME .....

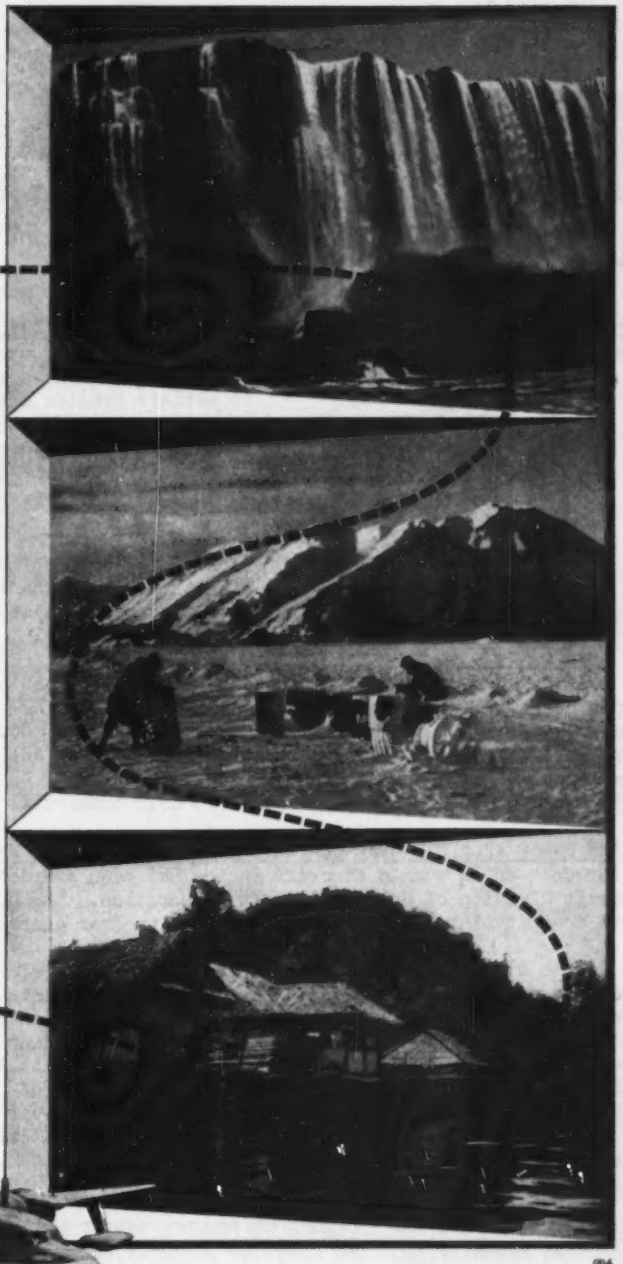
ADDRESS .....

..... AGE ..... (*Applicants from British Isles only*)

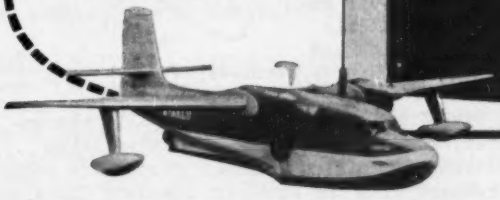
★ *If you are 14-17—and keen—join the Air Training Corps* ★

Impossible places

'Impossible' places are happy hunting grounds for the Sealand. Since a restricted stretch of water is all it requires to fly in and out, mountains, jungles and scattered islands are as accessible to this sturdy amphibian as any metropolitan area with imposing terminal facilities. It will travel very far North defying latitude and seasons, and it converts easily to undertake specialised tasks of all sorts—fishery service, air-sea rescue, survey, ambulance, marine aircraft conversion training, for example. And since it is economical to operate and easy to maintain, it is a profitable proposition for a variety of passenger or freight carrying duties. All in all, it has a great deal to offer business, industrial and official concerns—a great deal in fact that is well worth careful examination.



Shorts



Q4

Designed for areas where freight and passenger carriage is impracticable for normal aircraft

SEALAND AMPHIBIAN

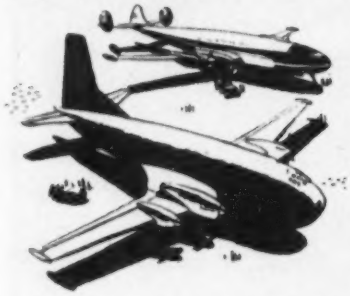
SHORT BROTHERS & HARLAND LIMITED,

The first manufacturers of aircraft in the world QUEENS ISLAND, BELFAST. LONDON OFFICE: 17 GROSVENOR STREET, W.1.

UNITED AIRGRAM

UNITED AIRCRAFT EXPORT CORPORATION

PRATT & WHITNEY TO POWER BIGGEST U.S. MILITARY TRANSPORTS --Two of the world's biggest air transports now in production will be converted to propeller-turbine engines, and when they are flying they will be able to achieve greater speeds and greater economy of operation than ever before possible. These aircraft are the U.S. Air Force's huge Douglas C-124B Globemaster, and the U.S. Navy R70 model of the Super Constellation.



Both will use the Pratt & Whitney T34 axial-flow propeller-turbine engine rated at 5,500 h.p. With this rating the engine is the most powerful single turboprop unit known to be in operation in the U.S. or abroad.

The T34 Turbo-Wasp will boost the payload of both aircraft substantially over piston-powered versions. In the case of the Navy R70 the payload will increase to approximately 35,000 pounds, and in the C-124, to about 75,000. Speeds for both transports will be raised very substantially, and due to the tremendous power available from T34 Turbo-Wasps, both aircraft will be able to operate comfortably from the 5,000-foot runways common to both commercial and military fields.

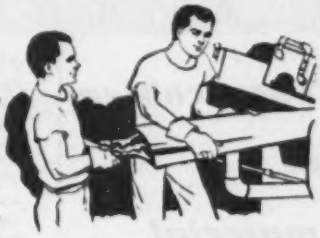
AIR FORCE ATOMIC ENGINE CONTRACT AWARDED TO PRATT & WHITNEY --An Air Force contract for work on an atomic aircraft engine has been awarded to the Pratt & Whitney Aircraft Division of United Aircraft Corporation. The U.S. Atomic Energy Commission is co-operating in consideration of the nuclear energy phase of this work.

This Air Force contract marks the active entry of the engine manufacturing division of United Aircraft into the atomic power field. It also marks another milestone in the program for the propulsion of aircraft by nuclear energy initiated by the Air Force and continued with the Atomic Energy Commission. The research department of United Aircraft participated in the original post-war exploration of the possibilities of utilization of atomic power for aircraft, known as the NEPA project, which was jointly sponsored by the Air Force and the Atomic Energy Commission.

CHRYSLER CORPORATION LICENSED TO PRODUCE HAMILTON STANDARD PROPELLERS --It was announced recently that the Chrysler Corporation has been awarded a multi-million dollar contract to prepare for the production of Hamilton Standard propellers under an engineering assistance and license agreement with the Hamilton Standard Division of United Aircraft Corporation.

The new defense project will be carried out at the Dodge plant at San Leandro, in the San Francisco Bay area of California. A 750,000-square-foot addition to the present San Leandro plant, now under construction, will be used for the manufacture

of propellers. While the plant will be under the authority of the U.S. Navy, it will also produce propellers for the U.S. Air Force.



The contract was let in accordance with the national policy of broadening the industrial base in the current emergency. The license was granted by Hamilton Standard without fee or royalty in keeping with United Aircraft's policy of extending full benefits of its production and engineering facilities to the nation in times of emergencies.

This agreement assures another major source of supply for Hamilton Standard's largest production type propeller, a sixteen-and-a-half-foot diameter version with four hollow steel blades. It is used on such aircraft as the U.S.Navy Lockheed P2V Neptune patrol bomber and North American's AJ-1 attack bomber, and the Air Force's Boeing C-97 Stratofreighter and Fairchild C-119 Packet transports.

SIKORSKY H-5 HELICOPTER HELPS CHECK COSTA RICAN YELLOW FEVER EPIDEMIC -- A lone H-5 helicopter of the U.S. Military Air Transport 4th Rescue Squadron stemmed the tide of a fast-spreading yellow fever epidemic in the tiny, jungle republic of Costa Rica, last fall. The helicopter, manufactured in 1944, enabled doctors to innoculate almost 1,000 natives in the almost-inaccessible North-Central part of Costa Rica.

Flying from an advanced base, the Air Rescue helicopter covered 6,000 square miles of remote territory in a 13-day period, in good weather and bad. During 42 landings, many of them in small remote tropical clearings, doctors were able to innoculate 978 natives. Although 31 had perished before the arrival of the helicopter not a single death from the fever was recorded after its arrival.

COLLIER TROPHY AWARDED TO HELICOPTER INDUSTRY, MILITARY SERVICES--Igor I. Sikorsky, engineering manager of Sikorsky Aircraft, represented the helicopter industry at White House ceremonies held in late December, at which the 1950 Collier Aviation Trophy Award was presented by President Harry Truman. In addition to the industry, the U.S. Coast Guard and the military services were included in the award for their part in the development and use of rotary-wing aircraft for air rescues.

The citation read in part, "...the helicopter although giving earlier evidence of its effectiveness in all parts of the world, emerged in 1950 as a major factor in the modern concept of air rescue under conditions of warfare. This development was a culmination of many years of effort in the design and construction of rotary wing aircraft led by Igor Sikorsky who, in 1939, achieved control and stability with the VS-300 helicopter..."

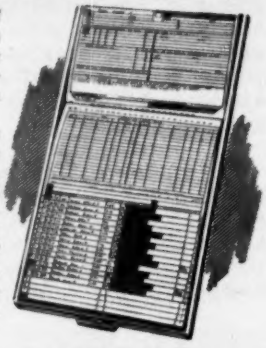
PRATT & WHITNEY - HAMILTON STANDARD EQUIPPED PLANES TRANSPORTED ROYAL COUPLE -- When Princess Elizabeth, heiress presumptive to the British throne, and her consort, Philip, Duke of Edinburgh, made their recent trip to Canada and Washington, D.C., they flew exclusively in aircraft equipped with Pratt & Whitney engines and Hamilton Standard propellers. The aircraft used were a BOAC Stratocruiser and a RCAF Canadair V.

UNITED AIRCRAFT EXPORT CORPORATION
EAST HARTFORD 8, CONNECTICUT, U.S.A.
European office: 3/5 Warwick House Street, London, SWI, England.

The problem of material and labour shortage

The efficiency of any organisation rests on its personnel equally with its material equipment and assets. Are you able—at a moment's notice—to lay your hand on the record, qualifications and experience of every employee? Or must you search for this information in last-minute, unorganised fashion?

The importance of Personnel Administration is acknowledged freely these days. But the only way to keep up with the fast-moving requirements of modern industrial relations is to have ALL the facts ALWAYS ready for you, ALWAYS set-out for you in methodically perfect order. With Remington Rand Personnel Records you can have that *complete* knowledge of *every* member of your staff which means—no bottlenecks, no wastage of labour—so important in these days—plus the efficient administration which results every time in higher productivity.



Remington Rand Systems

make production control effective

Write today for descriptive literature on Personnel Administration to:

REMINGTON RAND LTD. (Dept. KX111) Systems Division, 1-19 New Oxford St., London, W.C.1

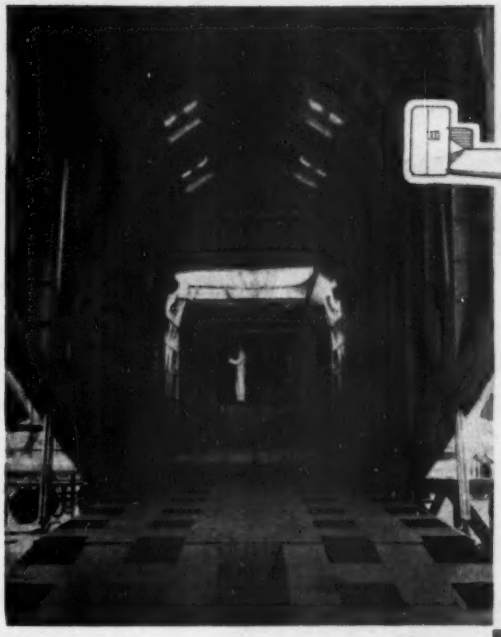
Telephone: CHAncery 8888 (30 lines)

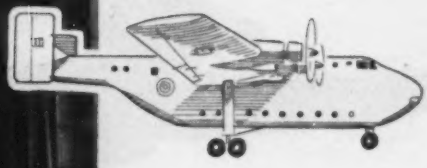
For tackling aircraft photographic problems

consult

Vinten

W. VINTEN LIMITED, NORTH CIRCULAR ROAD, CRICKLEWOOD N.W.2. TELEPHONE: GLADSTONE 6373

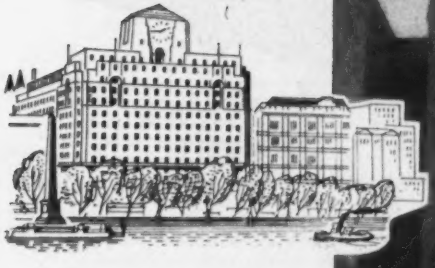




Interior view

of

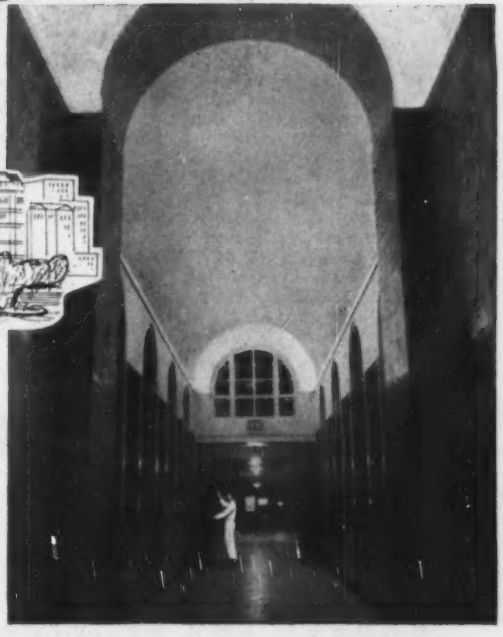
The Blackburn Freighter



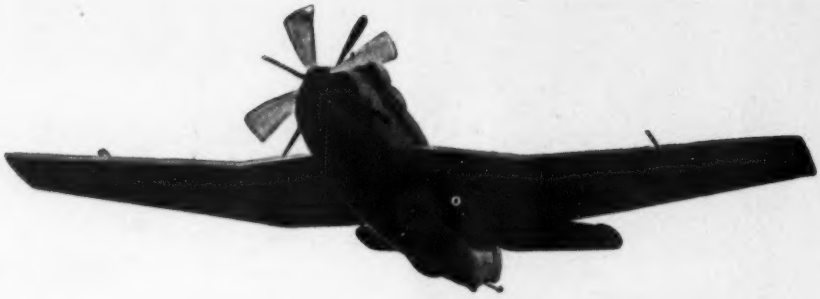
Interior of

Shell-Mex House,

Strand, London.

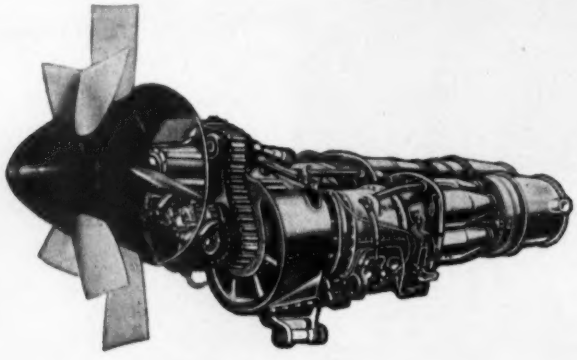


Shell-Mex House won't quite go into the Blackburn Freighter —but Shell Aviation Fuel and AeroShell Oil can . . . and do



'SINGLE DRAG'

The design benefits of a single engine formula



DOUBLE THRUST

The practical benefits of twin-engine power

FAIREY GANNET

(FAIREY 17)

ARMSTRONG SIDDELEY 'DOUBLE MAMBA'

TWIN-ENGINED • ANTI-SUBMARINE • CARRIER-OPERATED

CHOSEN FOR SERVICE IN THE ROYAL NAVY

THE FAIREY AVIATION COMPANY LIMITED, HAYES, MIDDLESEX

FLIGHT
and
AIRCRAFT ENGINEER

First Aeronautical Weekly in the World

Founded 1909

No. 2246 Vol. LXI. FRIDAY, 8 FEBRUARY 1952

EDITOR
MAURICE A. SMITH, D.F.C.

ASSISTANT EDITOR
H. F. KING, M.B.E.

TECHNICAL EDITOR
C. B. BAILEY-WATSON, B.A.

ART EDITOR
JOHN YOXALL

Editorial, Advertising and Publishing Offices:
DORSET HOUSE,
STAMFORD STREET,
LONDON, S.E.1.

Telegrams, Flightpress, Sedist, London.
Telephone, Waterloo 3333 (60 lines).

Branch Offices:

COVENTRY
8-10, Corporation Street.
Telegrams, Autocar, Coventry.
Telephone, Coventry 5210.

BIRMINGHAM, 2.
King Edward House,
New Street.
Telegrams, Autopress, Birmingham.
Telephone, Midland 7191 (7 lines).

MANCHESTER, 3
260, Deansgate.
Telegrams, Iliffe, Manchester.
Telephone, Blackfriars 4412 (3 lines).
Deansgate 3595 (2 lines).

GLASGOW, C.2.
26b, Renfield Street.
Telegrams, Iliffe, Glasgow.
Telephone, Central 1265 (2 lines).

SUBSCRIPTION RATES
Home and Overseas: Twelve months £3 3s. 0d. U.S.A. and Canada, $10.00 BY AIR: To Canada and U.S.A., six months, $16.

IN THIS ISSUE:

Alaska's Airlines - - - 144
Satellite Rockets - - - 150
Thirty Hours Airborne - 153
Handling Hydrogen Peroxide - - - - - 155
Hastings for New Zealand 156
Kentucky Farm - - - 158
Radio and Traffic Control 160
The Aeronautical Bookshelf - - - - - - 164

New Zealand Race Prospects

INDIVIDUALS, organizations, and nations are all eligible to enter aircraft for the England to New Zealand Air Race, which is scheduled to start on or about October 10th, 1953. This date is still a long way off, but entry forms are out and it takes a great deal of time to plan and to prepare aircraft for special occasions of this kind; unfortunately, the days when aircraft could be designed and built especially for a race are past. But first an answer must be sought to the question of whether this is to be just another air event or something altogether more important. Looking back over the years since the Kaiser's War, one or two international air races have assumed exceptional importance. The Schneider Cup contests, for example, and the 1934 England-Australia Race. We feel that this new long-distance race over a highway of the British Commonwealth is one which should receive as much support as possible. Clearly, the country cannot afford to be half-hearted and run the risk of being numbered only among the also rans. In prestige and world publicity value, the Christchurch Race can be expected to carry an importance far in excess of its primary purpose.

An enlightening hour can be spent in reading over the forecasts, reports and afterthoughts at the time of the 1919 Australia Race (for Australians) and of the 1934 MacRobertson Race to Port Darwin. Conditions have certainly changed since then, for in 1919 maps only covered a part of a route which had never previously been flown; and there were very few airfields. Pilots were, in fact, briefed to "use their own judgment" about landing grounds. It is remarkable that even two out of the six teams managed to arrive.

Winners of this historic competition were the late Sir Ross Smith, with Sir Keith Smith and crew, and the machine was a borrowed Vickers Vimy which reached Australia only 28 days after leaving Hounslow. These men blazed a trail which has been followed by tens of thousands in the intervening years, and more particularly they showed the world what aircraft were capable of doing. The £10,000 prize and the fostering of civil aviation in Australia have long been forgotten as the aims of that race, but who can say just how much Australian aviation owes to it and to the winning pilots?

The 1934 race was rather a different matter, and there are odd points of similarity in the New Zealand race now planned. We find, for example, a similar division into handicap and high-speed categories. There were the two-seat D.H. Comets—one of which won—specially prepared for the high-speed section, and there were also a surprisingly large number of light aircraft which soldiered on with the minimum of equipment and maximum of endurance on the part of the pilots. The DC-2 transport which gained second place represented in many ways as important an advance at that time as does the Comet airliner today, for it was the first "fast" airliner with such modern devices as retractable undercarriage and v.p. airscrews. The race to Australia did much to build up its reputation and confirm its performance and reliability.

It is no longer necessary to prove the feasibility of fast communications between England and the Antipodes and few technical novelties are likely to emerge as a result of the 1953 race; but large cash prizes and world-wide credit will reward the winners. Flight refuelling may well add to its list of successes, and the global bomber concept might reap support from the performance of, say, a B-36 should one be entered. Good "pit-work" may prove to be one of the keys to success, for there will be few aircraft capable of flying the course non-stop with or without refuelling, and bearing in mind the compulsory control-point in the region of Basra.

Provisional entries include manufacturers, airlines, individuals, and, it is said, the U.S. Army and Navy—formidable rivals who could put up practically unbeatable entries. To meet this array it is to be hoped that the British Services will also bring forth at least one worthy adversary. Would not a race such as this represent a worthwhile exercise in mobility for a flight or whole squadron? The chances in the high-speed section of such designs as the B-47, Series II Comet, Canberra, B-36 or 50, and perhaps the Bristol 175, each with its particular advantage of speed, range, high cruising altitude or combination of these qualities, provides food for pleasant, if fanciful, discussion.

ALASKA'S AIRLINES

Remarkable Expansion in an Area Where Operators Carry Oddly Assorted Freight

By FRANK ILLINGWORTH

TEN years ago Alaska relied for its supplies on coastal shipping. Bush-pilots provided a tenuous link between the settlements, and there was an infrequent and uncertain service to the United States. Today, thirteen airlines are operating in the territory. Air-freighters fly on regular schedules to the very shores of the straits separating Alaska and Siberia, and an assortment of Grumman Widgeons, Wacos, Travel Airs, Aeroncas, Stinsons, Cessnas and Bellancas operate between the larger towns and the trapping settlements in the wild, almost unexplored interior.

There are regular services between Alaska and the United States and Canada. The airport at Juneau (the capital) and that at Anchorage handle a constant stream of traffic on the northern Great Circle route to Tokio—both military and civil, for a major airlift has been in operation between Juneau, Anchorage and Tokio since the outbreak of war in Korea, when aircraft of Northwest Airlines and Pan American started operating from Seattle to Japan *via* Alaska. Subsequently American civil and military aircraft were supported by transports of the R.C.A.F. in flying wounded from Tokio to hospitals in the United States—again *via* a northern route which, before the 1939-1945 war, was predicted to be "entirely impracticable."

As long ago as 1932 Pan American bought up two aviation companies in Alaska, Pacific Alasca, Inc., and Alaska Airways, Inc. with bases at Fairbanks, Anchorage and Nome, and proceeded to develop an Alaskan service in the faith that the day would come when the Great Circle route via Alaska would be feasible. Subsequently, application was made to the Canadian Government for permission to include Whitehorse in a Juneau-Whitehorse-Fairbanks service, which was inaugurated in 1935.

Meanwhile, Pan American had bought up Alaska Southern Airways, which operated a charter service between Southern Alaska and the United States; and, using this as a foundation, they built upon it a weekly Clipper service between Alaska and the United States. This came into being in 1940.

Today, Juneau and Anchorage are shown as key points on world air-travel maps: recently I reached Fairbanks, in Central Arctic Alaska, in 52 hours from London (*via* B.O.A.C. to Montreal, Trans-Canada Air Lines to Edmonton, Canadian Pacific Air Lines to Whitehorse, and "bush-plane" to Fairbanks).

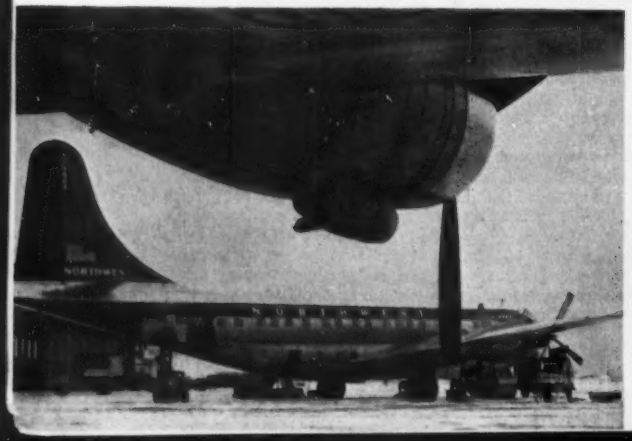
The inauguration and development of air services were reflected in a steady and marked extension of commerce and industry in Alaska; and, like the representatives of commerce, the prospector and trapper and lumberman of the interior were quick to grasp opportunities offered by the new transport medium.

For example, an "air laundering service" flies soiled linen from Fairbanks to Seattle for washing (a 3,400-mile round trip), the delivery-plus-laundering charge being 30 cents per pound, which is little more than the laundering-only charge in Fairbanks. Magazines appear on bookshelves in Alaska on the day of publication in the U.S. Cinemas in Fairbanks, Juneau and Anchorage show new films on the day of release in the States.

Following the spring break-up of the frozen rivers, trappers head for the settlements by boat or dog-team, there to pass the results of the seasons "trap" to bush-pilots for delivery to the air terminals. In the old days it took up to 90 days for pelts to reach "The Outside." Today, even the most distant trapper-settlement in Alaska is less than four days from the major fur markets in Canada and the United States—a vital factor in a trade wherein markets fluctuate.

The following figures reflect the development of air transport on "inward" services. The transports of one operator carried 1,604 lb in the peak month in 1940 and 30,000 lb in the record month in 1947. With a reduction of volume-cargo rates by as much as 62 per cent this same company handled 160,000 lb of "in" freight in February, 1948; by 1950 the figure for the peak month had risen to 250,000 lb, and has since more than doubled.

This striking photograph was taken through the cabin window of a DC-4 crossing the White Pass, between Juneau (Alaska) and Whitehorse (Yukon Territory), on the route of the Klondyke gold-rush.



Traffic at Alaska's airports may range from Aeroncas to the largest airliners, such as this Northwest Airlines Stratocruiser, seen at Juneau.

The genuine "Far North" atmosphere: a Pan American DC-4 at Fairbanks, key-point in the Central Arctic and North Alaskan route-networks.

Loads may range from 1,343 lb of snuff and three tons of frozen food to half-a-ton of ice-cream mixture, one ton of cottage cheese and ten guinea-pigs. Seven huskies were flown from Nome (on the Bering Straits opposite Siberia) to Fairbanks for last February's Winter Carnival Dog Derby. The flight over 500 miles of tundra took three hours: with a dog-team it would have taken three weeks—given good weather. Fresh milk is flown on regular delivery schedules 2,200 miles from Seattle to Nome for the school and the Walrus Men's Club.

Freight lists at Juneau airport include these items: 690 lb of fresh fruit, 68 lb of French-fried potatoes, 1,000 lb of meat and six barber's chairs; a two-ton shipment of plate-glass, medicine, newspapers, a hamster (small rodent resembling a guinea-pig) and a canary, a light tractor, metal sheets, military equipment and mining machinery. Freight on the "out" services ranges from gold bars to 1,000-year-old ice from Mendenhall Glacier—for sale to night-clubs in New York!

Juneau Airport is as modern in layout as any in the United States. Rates to the airlines who use its facilities are low. Instead of designing the airport and then offering facilities, Juneau City Council requested the interested companies to outline their requirements and these were incorporated in the original plans.

After Juneau had spent six years in trying to secure Federal aid in the construction of an airport it went ahead with the actual building in March 1947. Completion of the work in June 1949, at a cost of $145,000, was reflected in a marked rise in air freight between Alaska and the United States.

The boom in Alaskan aviation, however, really dates from American participation in the Second World War. In 1942, flying operations were geared to the war effort: the companies concentrated on military requirements, flying troops and equipment to the new bases flanking the Alaska Highway and at key points along the coast. Operating on a cost-plus basis, P.A.A. alone carried to Alaska and the Aleutian Islands more than 77,000 Service and other official passengers, and 3,170,000 lb of freight, the latter including a torpedo-boat engine weighing a few pounds short of a ton, a five-ton shipment of plate glass, and crane parts, machine-guns, diving gear, life-rafts and aircraft engines.

When the uneasy peace of the post-war years prompted the United States to embark on the extension of its military bases in Alaska and the Aleutians, the passenger aircraft operated by Northwest Airlines were "booked solid with carpenters and airfield construction men."

The design of the terminal building at Juneau Airport is well in keeping with the impressive "back-cloth" of mountain scenery.

The routes originally pioneered by the pilots of Northwest and Pan American, and the small companies they purchased, have been woven into the pattern of world air routes, and from them regular services are stretching ever farther into Alaska—across territory yet to be explored. Companies currently operating are:—

Alaska Coastal Airlines, Juneau (Bellancas, Lockheed Vegas, Curtiss Kingbirds, Grumman G21A, Catalinas); Alaska Airlines (one DC-4, one DC-3, one C-46); Alaska Island Airlines, New York and Anchorage (2 Grumman Widgeons, 2 Wacos, 1 Travel Air, 2 Aeroncas); Bristol Bay Airlines (2 Stinsons, 2 Bellancas); Byers Airways (one Cessna Crane, 2 Stinsons); Christensen Air Service (Noordyn Norsemen); Cordova Air Service (1 Norseman, 2 Stinsons, 3 Cessnas, 1 Piper); Ellis Air Lines, Ketchikan (6 Grumman amphibians, 3 Aeronca floatplanes); Northwestern Airlines, St. Paul, Minn; Pacific Northern Air, Seattle; Pan American Airways; Revolution Air Line, Anchorage; Wein Alaska Air Line, Fairbanks.

LOG of the ROYAL FLIGHT

TO judge from several remarks made to us by people outside aviation, last week's flight to East Africa by Their Royal Highnesses Princess Elizabeth and the Duke of Edinburgh must have done a great deal to popularize the idea of air travel in the minds of the public. The general reaction to the up-to-the-minute B.B.C. reports of the departure, journey and arrival was expressed in such comments as: "Just imagine! It seems only a few hours ago that they left London Airport in an icy wind—and now they're enjoying hot sunshine 4,300 miles away!" Seldom can the speed, comfort and safety of the modern airliner have been more effectively emphasized.

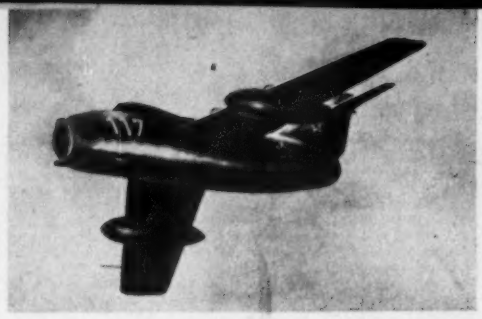
Princess Elizabeth and the Duke of Edinburgh left at noon on Thursday, January 31st, the King and Queen and other members of the Royal Family going to London Airport to bid them farewell. Sir Miles Thomas, chairman of B.O.A.C., and Sir John d'Albiac, commandant of the airport, were among the officials present.

The aircraft was a standard B.O.A.C. Argonaut (four Rolls-Royce Merlins) with modified interior arrangements, eight seats being removed to provide a private compartment consisting of two berths and the standard semi-circular lounge at the rear of the cabin. In the forward compartment, the 24 seats were rearranged to provide three pairs of facing seats and three sleeper seats on each side of the aisle. The modifications were made in such a way that the accommodation can quickly be reconverted for standard use, and then as easily adapted for future special flights when required.

An admirably factual record of the journey, based on progress-reports received in the B.O.A.C. operations room at London Airport, was issued by the Corporation soon after the aircraft reached

(*Concluded on page 147*)

FAREWELL for five months: Their Royal Highnesses Princess Elizabeth and the Duke of Edinburgh wave good-bye to other members of the Royal Family shortly before the B.O.A.C. Argonaut "Atalanta" takes off from London Airport.



RUSSIAN CONTRASTS: On the left is a light ship-borne reconnaissance aircraft of unknown type; a landplane version is also known to exist. On the right, enlarged and retouched from a snapshot, is an impression of a Mig-15 with external tanks, reported to hold about 80 gallons each.

FROM ALL QUARTERS

B.O.A.C.'s First Comet

LAST Monday, February 4th, the first D.H. Comet for B.O.A.C., already at London Airport for acceptance trials, was formally handed over—more than six months ahead of the contract date. Registered G-ALYS, it is the world's first jet airliner to receive a normal-category C. of A. B.O.A.C. had previously been operating a Comet on loan, and over 750 hr (337,000 air miles) had already been logged in crew-training and development flying.

An Airlift Celebrated

ON Monday last, Sir Frederick Handley Page entertained to dinner the past, present and future A.O.Cs.-in-C. Transport Command, and members of the Command associated with the recent Canal Zone airlift, which was carried out by Hastings aircraft. The dinner was held in the Hall of the Worshipful Company of Tallow Chandlers in London.

Air Marshal Sir Aubrey B. Ellwood, who is retiring, said in his reply to Sir Frederick's toast that, although only a small force of aircraft was employed, 21,500 men and 725,000 lb of freight were lifted between mid-October and the end of December. A.V.-M. C. E. N. Guest, now A.C.A.S. Ops. and shortly to take over Transport Command, said that every emergency which had arisen in the last few years had emphasized the value of the Command. The present A.O.C.-in-C. is A.V.-M. R. S. Blucke, who returned from Air H.Q. Malaya last autumn.

Dassaults and Leducs

AN experimental Marcel Dassault 450 Ouragan known as the 30L is characterized by side air-intakes. The machine made its first flight at Melun Villaroche on January 21st, and is intended to provide experience with the new intakes pending the completion of the Dassault 453 two-seat night fighter, in about two months' time.

Another item of news from France is that the fourth prototype of the Leduc ramjet aircraft is nearly complete. Though subsonic, it will be used as the basis for a supersonic development. The third machine, incidentally, has two Turboméca turbojets at the wing-tips.

Gen. Johnson Returning to U.S.A.

IT was announced last week that Maj-Gen. Leon W. Johnson, Commanding General of the United States Third Air Force in England, is to return immediately to the U.S. as Commanding General of the Continental Air Command at Mitchell Air Force Base, New York. He will replace Maj-Gen. Willis H. Hale, who is ill and has gone to hospital.

Maj-Gen. Frederick R. Dent, Jr., who has been Commanding General of the Wright Air Development Centre at Dayton, Ohio, will replace Gen. Johnson as commander of the Third Air Force.

Gen. Johnson holds the Congressional Medal of Honour for heroism in a U.S.A.F. attack on the oil refineries at Ploesti, Rumania, in the last war.

Crew-trainer Marathon

PERSISTENT rumours that the Handley Page (Reading) Marathon is to go into R.A.F. service as a crew trainer are strengthened by a photograph appearing in a *Handley Page Bulletin* and showing a model of the Marathon in R.A.F. colour scheme, with astrodomes, bomb-aimer's position in the nose, and, apparently, practice bombs outboard under the wings. Existing Marathons might also serve in the transport rôle.

Russian Carriers?

RUSSIAN officers are reported to have stated in Germany that the Soviet Navy now has three aircraft carriers. It appears that these have "outrigger" structures fore and aft to lengthen the landing and take-off run, that at the stern being tilted upwards. A deck-landing version of the Mig-15, with folding wings and arrester gear, is reported, in addition to a dive bomber of unknown designation. (A sketch of an alleged Soviet piston-engined dive bomber appeared in *Flight* last week.)

A Russian ship-borne reconnaissance aircraft and a wing-tanked Mig-15 are illustrated on this page.

French Nene Development

DURING the past three years, the Rolls-Royce Nene turbojet has been in licence-production by Hispano Suiza at Bois Colombes. The French company now announces a developed version of the Nene, under the designation Hispano Suiza R.300, an example of which has successfully completed a 150-hour endurance test.

The chief modification is the provision of hollow turbine-nozzle guide-vanes; they house corrugated baffles to control a cooling airflow tapped from the compressor. This has permitted the introduction of cheaper alloys and has also greatly reduced the use of "strategic" materials.

The R.300 is slightly larger than the Nene in all major dimen-

LYCOMING CHIPMUNK: In anticipation of possible orders the de Havilland company of Canada have built an experimental Lycoming-powered Chipmunk. With the bubble canopy standard in Canada, and the neat flat-six installation, it makes an attractive variant which should have a lively performance. The 190 h.p. Lycoming O-435 weighs only 70 lb more than the standard Gipsy Major and is 4in shorter. Note the exhaust cluster and two-piece cowling. R.C.A.F. Reservists use Chipmunks.

FOR NAVAL ATTACK: A model of the Douglas XA3D carrier-borne attack aircraft, soon to fly. A three-seater, it will be capable of over 600 m.p.h.; a.u.w. is unofficially quoted as 65,000 lb, and entry speed into the arrester wires as 90 knots.

sions, and is some 2½ per cent heavier. The net corrected thrust has been raised by nearly 1,000 lb to 2,700 kg (5,950 lb), although specific fuel consumption at full power has also risen—from 1.05 to about 1.09 lb/lb thrust per hour.

During the type-test of the first prototype, it is stated, emergency outputs in excess of 2,900 kg (6,400 lb) thrust were obtained, whilst the majority of the engine components completed the 150-hour test without needing replacement.

A New Viking Rocket

THE altitude record for a single-stage rocket—135 miles, established by the Martin Viking No. 7 last August—is shortly to be attacked again, according to a joint announcement by Glenn Martin and the U.S. Naval Research Laboratory.

Viking No. 8, which will be used for the attempt, will be greater in diameter, slightly shorter, and have fins of about three-quarters the area used on No. 7; the new dimensions will allow considerably more fuel (liquid oxygen and alcohol) to be carried. The power plant will again be made by Reaction Motors, Inc., and will generate approximately 20,000 lb of thrust.

As on the previous ascent, telemetering equipment in the nose of the rocket will transmit data on altitude, speed, temperature and cosmic-ray counts, all of which will be tape-recorded at the ground station. The Viking will also carry a camera.

The Meaning of "Rugged"

ON page 154 of this issue is a photograph of the U.S.A.F. B-36D which, on January 26th, made a remarkable "undershoot-landing" near Boscombe Down. It is said that the pilot—who was making a before-daylight approach to the airfield after a training-flight from America—came down through low cloud and mistook the approach lighting for the runway lights. He touched-down several hundred yards short, and the big bomber bounced over a haystack and a main road, before stopping. Then the pilot is said to have called for taxying instructions!

We mention in the caption to the picture that the bogie undercarriage appeared to have survived this drastic treatment in a remarkable manner. That this was indeed the case is borne out by a report published last Monday—after that particular page had gone to press—to the effect that the aircraft took off from Boscombe Down for its return journey to Carswell Air Force Base last Sunday. The only damage, apparently, had been the punching of two small holes in the nose, perhaps by fencing-posts or flying stones.

AIR MARSHAL SIR JOHN BOOTHMAN, Controller of Supplies (Air), M.O.S., recently visited the Alvis works to see for himself the step-up in Leonides production necessitated by the substantial orders the firm has received for these medium-power piston-engines for the Royal Navy and R.A.F. He is seen here with (right) Mr. J. J. Parkes, Alvis chairman.

LOG of the ROYAL FLIGHT

(concluded from page 145)

Nairobi. We reproduce it here in slightly condensed form. All times, unless otherwise stated, are G.M.T.

G-ALHK, *Atalanta* (states the account), left the apron at London Airport on schedule at 1200 hr. Capt. R. C. Parker, the master, taxied to the end of the runway and, after final cockpit checks, received control-tower clearance and took off in a westerly direction. On gaining sufficient height the aircraft turned to port, leaving Windsor Castle on the starboard side, and was cleared out of the London control zone over Chertsey fan-marker and the Dunsfold Radio Range to fly in a south-east direction, crossing the coast at Seaford at 1227 hr at 7,500ft, climbing. At 1229, when the aircraft was at 11,000ft over the Channel, Capt. Parker sent his last R/T. message to the Uxbridge South-East Flight Information Region; the next report received from the aircraft was through R/Off. James Miller, who reported seven minutes later by W/T., with the aircraft at 11,500ft over mid-Channel.

Thereafter, while G-ALHK was over France, its reports were sent to French control stations and, *via* the M.C.A. radio station at Birdlip, near Gloucester, to the B.O.A.C. operations room. At 1315 the aircraft was reported over the S.W. outskirts of Paris at 19,500 ft. This was the operating height originally planned, but beween Paris and Dijon, Captain Parker climbed to 21,500ft, presumably because of weather conditions.

After passing Dijon above cloud at a ground speed of 271 m.p.h., "HK" passed over the foothills of the Alps and the Swiss border; 76 miles S.E. of Dijon it reported a 44 m.p.h. tail-wind. Some 470 of the 1,859 statute miles from London to the refuelling-point at El Adem had then been covered, and cloud was encountered over the Alps. The course took the Royal party within a few miles of Mont Blanc.

At 1500 hr the aircraft was again at 19,500ft, N.W. of Pisa, three minutes behind its flight plan. This lost time had been made up by 1600 hr, at which time "HK" was flying over the Mediterranean, 67 miles west of Naples, above cloud and on schedule. By 1700 the Argonaut had crossed the toe of Italy, heading for the North African coast west of Tobruk. At 1800 it was at 17,500ft in cloud, approximately halfway between the toe of Italy and El Adem. At 1920 Capt. Parker was in R/T. communication with El Adem, where he landed at 1930. After a little over an hour's stop, where another crew took over, commanded by Capt. R. G. Ballantine, the aircraft took off at 2042.

Capt. Ballantine headed due south across the Libyan Desert and at 2130 hr was 135 miles south of El Adem. At 2204, when he had covered a further 100 miles, he reported: "G-ALHK now reached cruising altitude of 18,000ft and Royal Party now enjoying dinner."

After leaving the range of the radio beacon at El Adem, Capt. Ballantine would be using astro-navigation for most of the 2,514-mile flight to Nairobi, except where he was within range of the radio beacons at Khartoum and approaching Nairobi.

He reported "All's well" at 2300, and 30 min later was 539 miles south of El Adem. At 0015 (on February 1st) he signalled "Calm air, steady flight, Their Royal Highnesses have retired and are reported sleeping soundly." Shortly after midnight, when he was 730 miles south of El Adem, Capt. Ballantine changed course from due south to approximately S.S.E. In his report at 0030 he referred to a cross-wind on the starboard beam of 57 m.p.h., which had dropped to 50 m.p.h. when he reported an hour later from 360 miles W.N.W. of Khartoum. His ground speed at that time was 245 m.p.h. at 17,500ft.

When the next report was received from the aircraft, at 0230, it had passed the halfway mark between El Adem and Nairobi, and 1,197 miles remained. The course took it 95 miles N.N.W. of Malakal on the Nile, and the last position-report received in London—at 0430 hours—was from 667 miles N.N.W. of Nairobi. The Argonaut landed at Nairobi at 0712 and drew up at the alighting point, as planned, at 0715 G.M.T. (1015 local time).

A photograph of the Princess and the Duke inspecting the R.A.F. Guard of Honour at Nairobi appears on page 168, while on page 165 is a group of the East African Airways crew-members who have been selected to fly the Royal party to Mombasa.

HERE AND THERE

U.S.A.F. FLIES CANADIAN : First air-to-air picture of two of the Beavers ordered from the Canadian de Havilland Company for the U.S.A.F. Several "samples" were purchased early in the year (at least one is now operating in Korea) and last November it was stated that "a large number" had been ordered. In the civil field, D. H. Doves—exported from this country for dollars—are reported to be in considerable demand in the United States.

Jet Endurance

A REPUBLIC F-84G Thunderjet fighter of the U.S.A.F. is reported to have remained airborne for 12 hr 5 min. This mark of Thunderjet is equipped for flight refuelling and there is little doubt that such a technique was used.

Getting the Evidence

MOSQUITO DZ 414—in several ways a unique aircraft—is one of the two "heroes" of a founded-on-fact novel, *Crispin's Day*, to be published next week. DZ 414 gave long and faithful service with the R.A.F.'s Operational Film Unit, and the story—written by Leigh Howard, who was the navigator and camera-operator—centres on an imaginary low-level day flight across 400 miles of enemy territory to film the damage to the Mohne and Eder dams.

The Brancker Lecture

NEXT Monday, February 11th, Air Marshal Sir Frederick Bowhill, Chief Aeronautical Adviser to the M.C.A., is to deliver the tenth Brancker Memorial Lecture to the Institute of Transport; his subject will be *The Flying-boat and its Place in Aviation*. The lecture will be at 5.45 p.m. in the Jarvis Hall, 66, Portland Place, London W.1, and visitors may attend without ticket.

Inside Story

ON Wednesday next, February 13th, S/L. A. E. Callard, of transatlantic Canberra-flight fame, is to lecture to members of the Royal United Service Institution on *Long-range Jet Flying*.

Plan Forms

THERE is already a great demand for *British Aircraft to Scale*, a compact pictorial and tabular guide to 85 British civil, military and research aircraft. Reprinted in booklet form (with additions to bring it fully up to date) from a feature in the S.B.A.C. Show Number of *Flight* last September, this publication is obtainable from newsagents at 1s 6d, or by post at 1s 8d, from Iliffe and Sons, Ltd., Dorset House, Stamford Street, London, S.E.1.

COCKPIT MOCK-UP of the Vampire N.F.10 night fighter, illustrating the instrumentation for pilot (port) and radar observer navigator (starboard). There are detail differences in the actual aircraft installation, which we shall describe in a forthcoming issue. Incidentally, it was stated last week that a maximum speed of 519 m.p.h. was attainable at 45,000ft, whereas this speed corresponds to a height of 40,000ft. The minimum radius of turn at a Mach number of 0.7 and a height of 40,000ft, quoted as 0.5 nautical miles, should have read 0.95.

Undersea Aircraft ?

IN the course of a broadcast discussion in Washington, the famous explorer Sir Hubert Wilkins, who has recently been investigating polar defence problems with Col. Bernt Balchen, stated that submarines could carry aircraft under the Arctic ice to within 900 miles of all principal Russian targets. The idea is not quite so fantastic as it sounds: over 20 years ago, H.M. submarine M.2 carried a small biplane, the Parnall Peto, in a watertight deck-hangar.

Exemption for Apprentices ?

THAT the possibility of exempting skilled aircraft apprentices from call-up is "under examination" by the Government was stated in the Commons on January 29th by the Minister of Labour, Sir Walter Monckton. He was replying to Mr. W. A. Steward, who had complained that the call-up of such apprentices was retarding the production of aircraft for the rearmament programme. Mr. Ellis Smith observed that any exemptions granted should not be applied to one section of industry, but to all sections.

Hypothesis

A STATEMENT in London last week, attributed to Viscount Hinchingbrooke makes somewhat strange reading, although on consideration facts could scarcely be otherwise. It said that if war broke out between the United States and the Communists, Britain could control the use of American bombers based in this country for so long as she was not involved in the struggle. We should have an absolute right to insist that no American warplane taking off from this country would be allowed to return to its base here—if, indeed, it was allowed to take off at all. Obviously, the case is what would be termed an extremely hypothetical one.

Strategic Retirement

GERMAN airfields along the Iron Curtain have not enough "elbow room," and the U.S. Twelfth Air Force is moving most of its units to France in consequence. Announcing this, Maj.-Gen. Dean C. Strother, commander of the Central Tactical Air Force—which includes the U.S. 12th Air Force and the 1st French Air Division—said that the move would be made as bases in northern France became available. His command would continue to use German bases, but would rotate squadrons so that most strength would lie

For

Four

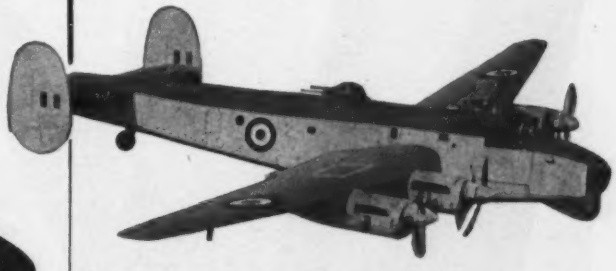
Engine

Safety

1000 MILES TO GO....

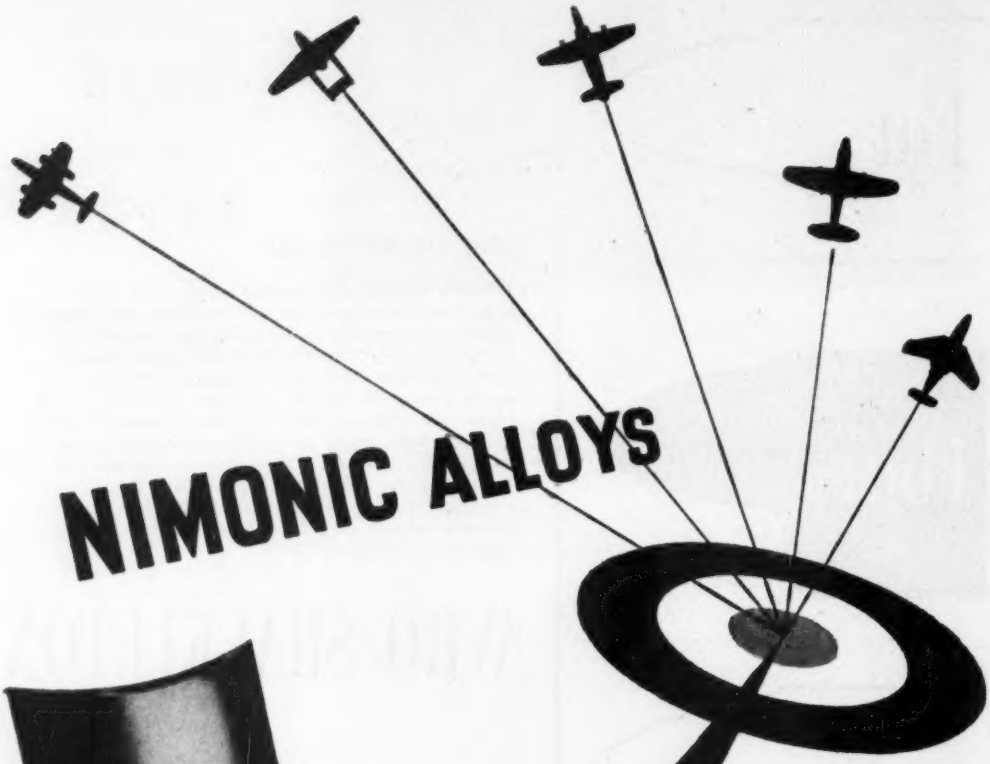
Patrolling thousands of square miles of lonely sea is a hard assignment for any aircraft and crew, especially when a dangerous attack may have to be pressed home against a flak-firing sub. At times like these it's good to have four powerful engines . . . good to know that should flak knock out one, or even two engines you can still wing your way surely back to base. Four engine reliability is one reason why Coastal Command has given production orders for the new Shackleton patrol/sub-hunter, a true fighting descendant of the famous Avro Lancaster and Lincoln bombers. With deadly armament, and accurate, long range radar, the Avro Shackleton is a steadfast, far-seeing comrade-in-arms for the anti-submarine ships of the Royal Navy and Merchant Marine.

AVRO SHACKLETON



A. V. ROE & COMPANY LIMITED, MANCHESTER

MEMBER OF THE HAWKER SIDDELEY GROUP / PIONEER . . . AND WORLD LEADER IN AVIATION



NIMONIC ALLOYS

The brilliant performance of Britain's military aircraft is one outcome of the metallurgical skill that produced the Nimonic Series of Alloys. These nickel-chromium alloys have proved repeatedly, both on test and in service, their ability to withstand the severe stresses at extreme temperatures encountered in the gas turbine.
Every British aircraft gas turbine in production makes use of one or other of the Nimonic Alloys for rotor blades.

"Nimonic" is a registered trade mark.

HENRY WIGGIN & COMPANY LIMITED · WIGGIN STREET · BIRMINGHAM 16

HERE AND THERE . . .

in France, his H.Q. moving from Wiesbaden to the Nancy-Metz area. The General also welcomed the suggestion of a West German Air Force; he pointed out that German pilots had been grounded for six years and would need a great deal of training. Operational units under Gen. Strother include fighter-bomber wings at Furstenfeldbruck and Neuberg (F-84), troop-carrier wings at Rhein-Main, Frankfurt (C-54 and C-82), a light bomber wing at Merignac (B-26), and a tactical reconnaissance wing (RF-80) now arriving in Germany, but being re-routed to the Nancy area.

Bang goes £1¼ million

IN contrast to the B-36D illustrated on p. 154—which, after a forced landing, crossed five fields and a banked-up main road, to stop unscathed—a similar aircraft which landed last week at Spokane, Washington, was not so fortunate: sliding off the runway, it hit a snow-bank, caught fire, and was destroyed. All 12 occupants —a small crew for a B-36—escaped unharmed.

New Era in Ship Propulsion?

THE Shell tanker *Auris*, which recently had one of her four Sulzer diesels replaced by a B.T.H. open-cycle gas turbine, has completed her maiden deep-sea voyage in this state. It is stated that the gas turbine has saved weight and space and uses less than one-fiftieth of the lubricating oil consumed by the corresponding diesel. In this installation, the turbine still drives the original alternator, but alone can propel the *Auris* at over seven knots, while consuming three-quarters of a pound of low-grade oil per b.h.p. per hour.

A.O.P. on Wheels

NO. 663 A.O.P. Squadron, R.Aux.A.F., winners of last year's A.O.P. Efficiency Cup, carried off the prizes for both team and individual entries in a "miniature Monte Carlo rally" organized by Merseyside Territorial Army units on January 27th. The squadron's team of three Land Rovers, each with a crew of three and led by Maj. J. R. Bandy, won the team competition with 408 points out of a possible 669. A fourth vehicle, from the squadron's Manchester Flight, won the prize for the best individual crew. The vehicles competed on an 80-mile course taking competitors over the snow-covered Rivington Pike, near Bolton, and included a stiff map-reading test, some tricky cross-country work, and a high-speed test round the perimeter track of the old Naval Air station at Burscough. Thirty-six vehicles took part. Competitions of this type are clearly of value in inculcating team-spirit.

The Universal Cry

THE aircraft industry of the United States is short of somewhere between 30,000 and 60,000 trained engineers, according to Mr. W. B. Bergen, vice-president of the Glenn L. Martin Co. "Vacancies are not being filled by new graduates," he says, "and there has been no substantial migration of trained men from other industries into the aviation field."

IN BRIEF

A LECTURE on *Metallurgical Problems Arising from Stratospheric Flight* is to be given before the Institute of Metals in London on March 6th, by Maj. P. L. Teed, F.R.Ae.S., M.Inst. Met.

* * *

Magnetic Devices, Ltd., have changed their address from Sturton Street, Cambridge, to Exning Road, Newmarket (telephone 3181/2).

* * *

A 400-ton extrusion press for the production of cored solder is among equipment installed in the new Croydon, Surrey, factory—due to start production in a few weeks—of H. J. Enthoven and Sons, Ltd., the solder specialists.

* * *

Organized by the Machine Tool Trades Association, the International Machine Tool Exhibition—held in London at four-year intervals—is to take place at Olympia from September 17th to October 4th. The 250,000 sq ft of exhibition space is already booked.

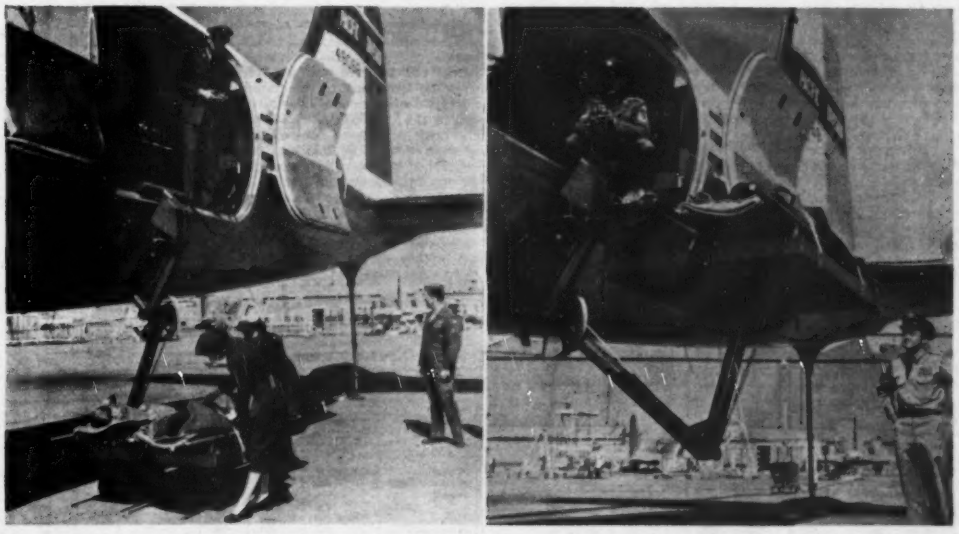
* * *

Following the appointment of Mr. Walter M. York (publicity manager) to the board of E. K. Cole, Ltd., Mr. John E. Furley becomes assistant publicity manager and Mr. Michael K. Kaye is appointed Press Officer.

* * *

New literature from the Morgan Crucible Co., Ltd., lists the standard "Reservoil" oil-retaining bearings now held in stock, summarizes their properties, and recommends methods of usage that will give the best results. Sintered from graded bronze or iron powders, and machined to close limits, these bearings have a porous structure which, it is stated, enables them to hold up to 30 per cent of oil, by volume.

SELF-CONTAINED ELEVATOR FOR CASUALTY OR FREIGHT LOADING



Shown in operation on a Douglas C-54 of the Pacific Division of the U.S.A.F. Military Air Transport Service, this new mechanical loader for transport aircraft is being used in the evacuation of casualties from Korea. Weighing only 160 lb, it is claimed to be able to handle loads of up to 500 lb and to need only one operator. Power is drawn from the aircraft accumulators, and the lift can be adapted for attachment to a number of aircraft types. In flight, it can be stowed in a folded position on board, occupying a smaller space than its appearance would suggest.

SATELLITE ROCKETS

Projects for "Minimum Vehicles" to Perform Various Research Duties

THOSE who have studied the possibilities of interplanetary flight have long been convinced of the practicability of space-vehicles which, propelled in successive "steps," could take up a closed orbit relative to the Earth and thereupon become self-supporting satellites. In this study, four types of rocket are outlined which could be used not as man-carrying vehicles but for lifting research instruments. The survey, by K. W. Gatland, M. Kunesch and A. E. Dixon, was one of the papers read at the Interplanetary Society's Second International Congress on Astronautics, in London last September.

ONE'S first duty in a study of this kind is to define precisely what is meant by the term "minimum satellite vehicle," as there are clearly several objectives that can be fulfilled by "minimum" rockets designed for specific experimental tasks.

In this survey four vehicles are considered, and to obtain a useful comparison between them we have adopted the following standard parameters: height of orbit, 800 km (500 miles); propellant, liquid oxygen/hydrazine; specific impulse, 325 sec. In every case, the rockets are considered as three-step vehicles, with the fourth scheme illustrating the application of expendable tanks; the performance is based on a characteristic velocity of 10 km/sec. Accelerations have been taken as 1g effective at take-off, rising to 6g at "all-burnt" for the first and second steps of Schemes A, B and C; in the case of Scheme D, the variation is slightly greater as the result of expendable construction, being between 1g and 6.6g for the first step and between 1g and 7.25g for the second step. It is relevant to all schemes that since the third steps will be firing tangentially to the Earth's surface and are therefore undergoing negligible g loss, a low acceleration may be used, which gives the dual advantage of reduced motor-weight and more sensitive control of velocity towards the "all-burnt" stage.

The "absolute minimum vehicle," to which we refer as Scheme A, will be designed with the primary objective of projecting a body into a closed orbit with the minimum of controlling equipment. This experiment would be of the nature of a first approximation for checking the stability of the orbit in conjunction with tracking radar.

Scheme B may be regarded as an extension of Scheme A to allow for a useful payload of 100 kg (220 lb), sufficient for the installation of a small multiple-channel telemetering system for recording various data (e.g., cosmic radiation, ultra-violet radiation, ambient temperature, etc.).

Scheme C is basically similar to Scheme B, with additional control equipment for obtaining improved accuracy over the final path of the trajectory.

Finally, Scheme D illustrates the influence of expendable-tank construction and affords a direct comparison with Scheme C in terms of variation in payload, the all-up weight and weight of control equipment being the same for both projects.

One of the first obstacles in attempting an analysis of rocket performance concerns weight estimates, for upon the accuracy of the figures derived will depend the usefulness of the survey. The weight estimates used in these studies have been based on a careful breakdown of the A-4 structure and on empirical rules resulting from previous work (refs. 1, 2); these have been verified for the most critical cases by stress calculations carried out on the initial steps of Schemes A and C.

At this point, some general observations on the types of construction we have envisaged may be of interest, particularly with regard to tank layout. In the case of the first step of the Type C vehicle, the structure was considered on the basis of the A-4 configuration, in which the propellant tanks are separate from the load-carrying structure. Subsequently, we investigated the possibility of using the outer tank-wall as an integral structure, strengthened by four longerons running the full length of the fuel bay, the large curved panels of the rocket's skin being stiffened by stringers and transverse frames and sealed against loss of pressure. This tank structure, which houses the fuel and oxidant within two concentrically arranged metal shells, is of annular layout. The oxidant is carried in the inner shell, which is made up of two thin-gauge cylinders held apart by equally spaced Z-section stiffeners, the space between being insulated with glass wool. The fuel occupies the remaining space between the oxidant tank and the outer main load-carrying structure of the rocket. The tank-ends are regarded as flat circular diaphragms bounded by reinforcing rings. All loads are assumed to be transferred from the diaphragms to the rings by radially disposed members, acting in much the same way as the spokes in a wheel. The diaphragms form pressure-tight bulkheads across the full section of the rocket.

It is emphasized that here we are considering an integral type of structure, there being no separate outer skin to the propellant tank. The result is that the combined tank and structure can be lighter than the conventional construction owing to additional strength obtained from pre-tensioning effects due to the tank pressurization—a nominal 1.76 kg/cm² (25 lb/sq in).

The total weight of a structure of this nature was calculated and showed a saving of approximately 8½ per cent over the conventional A-4 type construction which we actually used as a basis for the performance calculations. A further minor variation consisted of replacing the flat tank-ends with hemispherical ends, which are assumed to be suitably joined to the tank skins; this small change amounted to an additional weight economy of 2½ per cent. These figures give a small indication of how useful improvements of the structural factor can be made by careful design.

In the case of the "absolute minimum vehicle" (Scheme A), there is no specific payload, so size is determined only by the weight of control equipment required for guiding the final step into the sub-orbit.

The techniques involved in placing a vehicle into a closed orbit have already been fully dealt with (ref. 3) and need not be repeated here. The method we have adopted for controlling the rocket over the final path of the trajectory is straightforward, since all guidance equipment will be carried not in the final (satellite) step but in the step beneath it. The second step will therefore have the responsibility of controlling the trajectory until the moment of separation of the final step, the interval before separation being controlled by steam jets from the pump unit in the second step. In this way, the control system of the final step need not be capable of holding the rocket to a curved flight-path as it will be aligned on a tangent relative to the Earth's surface by the second step and will require merely an inertial control, similar to that of the A-4, to prevent its axis from wandering. This would, in effect, entail a simple gyro system, in conjunction with exhaust vanes, or a "pivoting motor," to correct pitch and yaw during the final period

SCHEME "A"

	First step	Second step	Third step
Payload	2,880	210	—
Control	—	100	25
Structure ...	1,000	350	30
Pumps and motors	1,730	300	15
Propellant ...	11,190	1,920	140
All-up weight ...	16,800	2,880	210
Propellant flow (kg/sec)	108.6	18.64	0.68
Thrust	33,600	5,760	210
Firing time (sec)	103	103	206
Acceleration (g)	6	6	3
Length (m) ...	15.6	9.3	3
Diameter (m) ...	1.9	1.05	0.5
No. of motors ...	1	1	1

Note: *All weights and thrust in kg.*

SCHEME "B"

	First step	Second step	Third step
Payload	10,700	1,050	100
Control ...	—	100	25
Structure ...	3,720	1,300	150
Pumps and motors	6,430	1,110	75
Propellant ...	41,550	7,140	700
All-up weight ...	62,400	10,700	1,050
Propellant flow (kg/sec)	403	69.3	3.4
Thrust	124,800	21,400	1,050
Firing time (sec)	103	103	206
Acceleration (g)	6	6	3
Length (m) ...	20.5	12.0	5.25
Diameter (m) ...	3.0	1.7	0.9
No. of motors ...	5	1	1

Note: *All weights and thrust in kg.*

of thrust which brings the "satellite" step to true orbital velocity. Only the first and second steps will be under true guidance, all control being broken off when the third step separates.

The all-up weight of the Type A vehicle was estimated at 16.8 tonnes, the overall length being 15.6 m (51ft) with a maximum diameter of 1.9 m (6.2ft)—approximately the same linear dimensions as those of the A-4. Additional data for this project appear in Table A.

As the final step of the "absolute minimum vehicle" will be of particularly small dimensions (3 m long by 0.5 m in diameter), it might be possible, for a very small weight-penalty, to incorporate a metalized "paper" balloon for use as a radio reflector; it could be attached to the rocket and puffed up in space. A further development of this vehicle might usefully employ a radio beacon in the final step for position-finding, with an instrument for measuring a single quantity (e.g., cosmic ray intensity), the data being incorporated in the return signal. The American investigators Malina and Summerfield have suggested that such a device might be produced for a weight of 4.5 kg (10 lb) (ref. 4).

In the second project, Scheme B, we have sought to illustrate the influence on the take-off mass of 100 kg (220 lb) of useful payload carried in the final step. The allocation of control equipment is the same as for Scheme A, namely, 25 kg (55 lb) in the final step (inertial) and 100 kg (220 lb) in the second step for true guidance.

Owing to the incorporation of payload, the all-up weight (16.8 tonnes for the previous project) has risen to 62.4 tonnes, resulting in an overall length of 20.5 m (67ft) and a maximum hull-diameter of 3 m (10 ft). To achieve in the initial step a practical motor arrangement commensurate with present-day experience, the 125 tonnes thrust is assumed to be produced by five motors.

The experience gained with satellite vehicles of larger dimensions will permit the design of orbital rockets capable of a finer degree of control than would hitherto have been possible with, for example, the merely directionally guided satellite steps of Schemes A and B. The Type C vehicle, therefore, again has the 100 kg payload of Scheme B, but with an additional 75 kg (165 lb) of control equipment incorporated in the final step; the result is that the all-up weight (62.4 tonnes for Type B) has been increased to 91 tonnes, the overall length of the vehicle being 24 m (79ft) with a maximum hull-diameter of 3.5 m (11.5ft).

The design of the final vehicle we have considered, Type D, is of a more speculative nature and its various features would not, in practice, be combined until they had been proved separately. Principally, it illustrates the influence of expendable-tank construction and affords a direct comparison with the Type C vehicle in terms of variation in payload, the all-up weight and weight of control equipment being identical with the former project.

Expendable construction has been the subject of certain of our previous papers (refs. 1, 2). It consists of jettisoning from a rocket (under thrust) propellant tanks formed as half-cylinders which, when bound together with explosive ties, act as an integral load-carrying structure and form part of the hull of the initial steps.

Scheme D is considered as a three-step vehicle with the component steps situated one within the other. This arrangement has the advantage of decreasing the overall length and thereby reducing the bending moment and facilitating the control of the rocket. Additionally, the second step extends into the motor bay of the first step, so that the central motor of the lower group is eliminated. The second step motor is thereby allowed to do useful work during the burning time of the first step instead of lying idle over that period.

The steering of the first step would probably be controlled by exhaust vanes, by reason of the close multiple mounting of the motors. This arrangement would necessitate the locking of the "pivoting motor" of the second step until the time of separation, which would occur 100 secs after take-off. The propellant feed for the motor of the second step, during the period it is functioning as part of the first, would be taken from the tanks of the first step via a low-pressure boost pump through feed pipes and a non-return valve, and thence into the propellant tanks of the second step which would thus be kept topped-up until separation.

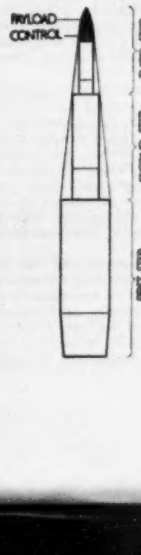
For the same all-up weight as the Type C vehicle, (91 tonnes), the overall length of the rocket is reduced from 24 m (79ft) to 12.5 m (41ft), with a maximum hull-diameter of 4 m (13ft). It is found that improvements in the overall mass-ratio of this project will permit, for the same all-up weight and performance, an increase in weight of payload of more than double—from 100 kg to 220 kg (485 lb).

The uses to which minimum satellite vehicles may be put are varied. Some have already been mentioned, and certainly, as an extension to the existing American high-altitude programmes, the orbital rocket will be of considerable value, for although altitudes of between 65 and 135 miles have been attained by A-4 and Viking rockets, the period of time spent above the limit of radio-sonde balloons (which is approximately 25 miles) is only about five minutes. The extension of radio-telemetering into free space will permit the study of corpuscular and electromagnetic radiations, emanating from outer space, and these phenomena will be observable for long periods without the interference of disturbing secondary effects caused by the atmosphere. Perhaps most important of all is the study of cosmic-ray primaries, with all the great implications to nuclear physics and our further understanding of the character of the Universe. There are, however, several other benefits to be derived from the early development of satellite vehicles, among the most obvious being the recording of the density of interplanetary gases. Such a rocket could also obtain a complete solar spectrum continuously, except when in the Earth's shadow.

Willy Ley has suggested that the unmanned satellite rocket might even furnish data concerning the average number of impacts of meteoric dust particles, which may be less than 0.1 mm in diameter. Visual brightness, he points out, might provide a clue to the density of cosmic dust. If we imagine that the rocket leaves the Earth with a polished hull, its high reflection should be gradually converted to spread and even ultimately to diffuse reflection by the impact of tiny cosmic particles, with a corresponding change in its visual brightness. As the reflecting powers of the rocket diminish, its temperature must increase, because more solar radiation will be absorbed and less of it reflected back into space. From the reduction of visual brightness, observed directly, and the increase in temperature reported by the instruments, the probable number of cosmic particles would be established within fairly reasonable limits.

Studies made in conjunction with small non-returning satellite rockets are, therefore, likely to have great bearing on many branches of science, with maximum benefit in the fields of astrophysics, astronomy, meteorology, radiocommunication, guided missiles and astronautics.

Power for supplying the instruments will be a problem of its own if the vehicle is to have a useful operating life. Batteries will be useless beyond a period measured in weeks and, although we may ultimately hope to find the solution in a nuclear reactor—which might be made relatively light, since, for many classes of research, shielding can be eliminated—our early schemes may conceivably rely on the fact that a temperature differential will exist between the sunward side of the rocket and the side in shadow; the application of thermo-elements as a source of power is accordingly a distinct possibility, perhaps enabling short transmission to take place, separated by fairly long intervals. Alternatively, we may find more suitable for the purpose, a solar regenerator whereby solar heat is concentrated by means of a concave mirror on to a closed system of pipes containing a volatile



SCHEME "C"

	First step	Second step	Third step
Payload	15,600	1,680	100
Control ...	—	—	100
Structure ...	5,420	1,900	240
Pumps and motors	9,350	1,620	120
Propellant ...	60,530	10,400	1,120
All-up weight ...	90,900	15,600	1,680
Propellant flow (kg/sec)	587.7	101	5.4
Thrust	181,800	31,200	1,680
Firing time (sec)	103	103	206
Acceleration (g)	6	6	3
Length (m) ...	24.0	13.25	6.0
Diameter (m) ...	3.5	1.9	1.0
No. of motors ..	5	1	1

Note: All weights and thrust in kg.

SCHEME "D"

	First step	Second step	Third step
Payload	18,300	2,670	220
Control ...	—	—	100
Structure ...	6,200	2,340	300
Motors and pumps	7,400	1,910	190
Propellant ...	59,000	11,380	1,780
All-up weight ...	90,900	18,300	2,670
Propellant flow (kg/sec)	587.7	118.5	8.6
Thrust	181,800	36,600	2,670
Firing time (sec)	100	96	206
Acceleration (g)	6.6	7.25	3
Length (m) ...	12.5	8.25	5.25
Diameter (m) ...	4.0	2.5	1.2
Expendable tank-bays	3	2	—
Mass ratio (actual)	2.84	2.64	3
No. of motors ..	6	1	1

Note: All weights and thrust in kg.

SATELLITE ROCKETS . . .

fluid. Boiling of the liquid by the trapped solar energy would serve to operate a small turbo-generator. It remains to be seen how lightly such units can be constructed, but it appears unlikely that solar regenerators can be used in the smallest types of satellite rocket. It might be pointed out, however, that power would need to be sufficient to work the instruments only for certain limited periods and that the energy available from the generator could be stored between the time of closing down and opening up of each transmission.

The introduction of equipment of this nature will immediately introduce uncertainties into the mind of anyone who has had dealings with automatic instrumentation, even of the most modest kind. The consternation that would be caused, for example, by the premature burning-out of a radio valve (not, we think, a rare source of trouble in electronic equipment!) can be imagined, and to the authority responsible for the satellite vehicle the valve-manufacturer's six months' guarantee will be small consolation.

Nevertheless, it is remarkable to what extent automatic radio devices have been developed, as may be judged from the multiple-channel telemetering systems used in the American high-altitude research programme.

One final illustration, however, may be given. A self-contained automatic weather station, which transmits weather data by radio has recently been developed by the United States Bureau of Standards. The device, designed in the shape of a bomb, can be parachuted from aircraft on to inaccessible territory. The impact of landing ignites a small explosive charge which disengages the parachute and prevents the station being pulled along the ground. Either immediately, or following a pre-set dormancy-period, another explosive charge causes the station to rise into an upright operating position by means of six spring-loaded legs. A third explosive charge extends a telescopic vertical antenna to a height of 20 feet; all these actions are controlled by an electric clock. The station is then ready for automatic transmission at intervals predetermined by the built-in timing mechanism. The development model has an output of the order of 5 watts and, operating on a frequency in the neighbourhood of 5 megacycles, it has performed reliably over land ranges of more than 160 km (100 miles). The dry batteries used provided power for transmission of weather reports at three-hourly intervals for more than 15 days.

These are some of the problems (and prospects) involved in the development of Minimum Satellite Rockets of a kind which are already being considered by the United States Military Establishment in the Earth Satellite Vehicle Programme (ref. 5).

References

(1) K. W. Gatland, A. E. Dixon and A. M. Kunesch: *Initial Objectives in Astronautics*, Journal of the British Interplanetary Society, July 1950, p. 155-178.

(2) K. W. Gatland, A. E. Dixon and A. M. Kunesch: *Symposium on the Orbital Rocket*, Jour. B.I.S., May 1951, p. 97-123.

(3) D. F. Lawden: *The Ascent of Satellite Vehicles*. To appear shortly in the Journal of the B.I.S.

(4) F. J. Malina and M. Summerfield: *The Problem of Escape from the Earth by Rocket*, Journal of the Aeronautical Sciences, August 1947.

(5) J. V. Forrestal: *First Annual Report to U.S. Congress on the National Military Establishment*, December 1948.

VANDENBERG SPEAKS HIS MIND

U.S.A.F. Chief of Staff Talks of the Mig-15 and Other Problems

NEW light on the Russian Mig-15 jet fighter and on various aspects of modern air warfare has been shed by General Hoyt S. Vandenberg in an interview with our American contemporary *Aviation Age*.

The General declared that the Mig had a slight advantage over the F-86 in rate of climb at all altitudes, but that the American fighter was superior in range. At heights up to 25,000ft the F-86 had an equivalent speed, could out-dive the Mig-15, and appeared to handle better; at greater heights, however, the Mig was somewhat faster and, being lighter, had a higher service ceiling. General Vandenberg summarized his views by saying that the two machines were "roughly in the same general area of technical development".

Replying to questions put to him, the General remarked that Soviet Russia had long been air-minded and that, with the help of ex-patriated German designers and production experts, had made brilliant progress. The numbers and quality of Russian-built jet aircraft in Korea left little doubt that, at least in the category of the jet intercepter, they had solved many of the important problems of design and production. In other categories, notably long-range bombers, known designs appeared to have lagged behind those of America. However, the Russians were putting a vast effort behind their long-range bomber force. The General continued: "At a time when we were disarming after World War II, it is apparent that the Russians were putting forth their best efforts. As a result, they have the jump on us; but I am confident that American production eventually can overcome this advantage."

The Russians, said General Vandenberg, were known to have fighter prototypes superior to the Mig-15, but these had not appeared in numbers. In general, the workmanship and production techniques indicated by captured Mig-15 parts were of a high order. Information concerning these techniques had been made available to the U.S. aircraft industry. The engine of the Mig was of greater thrust than that of the F-86 now in combat but America had units of far higher thrust in production and development—as, it must be assumed, the Russians had also. The General thought that the American pilots had been coping adequately with the Mig in air-to-air combat. "We have investigated", he said, "the advantages of greater angle of sweep, delta wings, and straight wings on special research airplanes. The knowledge thus gained is being reflected in the design of aircraft now flying and in development."

The representative of *Aviation Age* stated that the Mig is equipped with 23 and 37 mm cannon, and wondered why America was continuing with the 0.5in machine-gun. To this the General replied that weight was an effective instrument in fighters. "When you add large-calibre armament to an aircraft," he said, "the number of rounds that you can fire is strictly limited. This required increased accuracy, which is difficult at high speeds. To date, our 50-calibre machine gun has proved superior to the Russian-installed cannon of the Mig-15. However, we are not satisfied and we are continuing to experiment with better weapons".

Concerning strategy and tactics, General Vandenberg said that the basis developed in World War II still held, though the greater speed and height possible with jet engines had changed the application of that basis materially. On the subject of interdiction, he said that "Operation Strangle" was undertaken with the prime objective of preventing the enemy from getting enough supplies through to the front to conduct a sustained offensive and, in the process, to impose a relentless attrition on his rail and highway transport. In more than four and a half months, during which "Strangle" had represented the major U.N. military effort, the enemy's rail transportation system in North Korea had been shattered and he had lost, at the rate of about 7,000 per month, trucks with which he tried to make good his loss of rail transportation. In the judgment of the senior commanders of all services in the Far East, including General Ridgway himself, the operation had been highly successful.

It was known, said General Vandenberg, that the Communists had good radar and lots of it. Thus far enemy night operations had been sporadic, but his capabilities in this direction appeared to be increasing.

The question of "freezing" designs such as the F-84 and F-86 in order to speed production then arose, and General Vandenberg said that freezing was possible to a limited extent in World War II because the piston-engine had been in existence for a long time and countless improvements had already been incorporated. Unfortunately, the turbojet was in its infancy, and more changes had to be made than during World War II to ensure sufficient speed, altitude and rate of climb.

The question as to whether guided missiles would completely supersede inhabited aircraft on the distant side of the sonic barrier was as yet entirely theoretical. The U.S.A.F. was committed to the fullest possible development and use of guided missiles in all areas where they could be profitably substituted for piloted aircraft. Meanwhile, automatic equipment was being developed to enable the pilot to cope with problems arising mainly from high speeds, high altitudes and the complexities of all-weather operation. "Nothing has been invented," averred the General, "or is in sight today that will entirely replace the human hand and brain in combat."

On the subject of Russian bombers, the General said that the Russians had displayed a bomber larger than the B-29 but smaller than the B-36. It could have a radius of action extending from Soviet bases deep into the United States. Finally, in discussing air power, he remarked that the joint Chiefs of Staff and Secretary of Defence had recommended that the U.S.A.F. be built up to a strength of 143 wings, consisting of 126 combat and 17 troop carrier wings. With this decision he agreed.

IT was with the most profound sorrow that we learned, soon after the pages of this issue had closed for press, of the death of our beloved King. The shock of the news was all the greater by reason of the fact that only the day before we had been taking pleasure in recording the details of Princess Elizabeth's and the Duke of Edinburgh's air journey to Africa, and of the Queen's recent visit to No. 600 (City of London) Squadron.

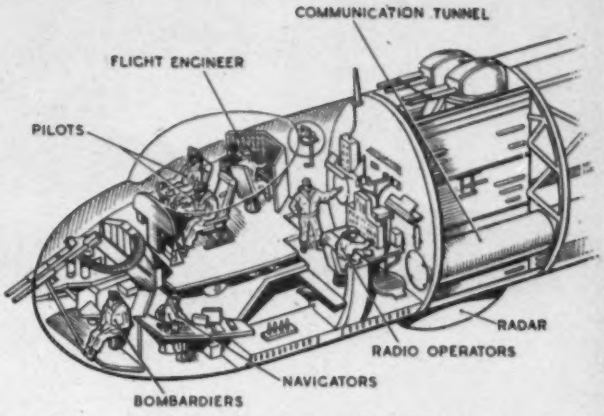
During the whole of his reign His Majesty King George VI had taken an interest in aviation far deeper than that conventionally attaching to the duties of the Throne, and unquestionably this dates from the time when, shortly after the First World War, he himself learned to fly. As Prince Albert, he received instruction on a 504K Avro at Croydon. Since his accession in 1936 he had consistently made use of air travel, particularly in latter years, when both he and the members of his family flew many thousands of miles, on State occasions and on private journeys, in the Vikings of the King's Flight.

The flying Services, and their associated organizations, will sadly miss the inspiration of his leadership. Holding the rank of Marshal of the Royal Air Force, he was Air Commodore-in-Chief of the Royal Auxiliary Air Force, the Royal Air Force Regiment, the Air Training Corps and the Royal Observer Corps. The Air Forces of the British Commonwealth and Dominions overseas, too, will mourn him; almost his last public duty before his recent severe illness was to meet, at Balmoral, members of the Air Cadet League of Canada who were visiting this country.

If there is solace for us at this time, it lies in the thought that a great and good king is now followed to the throne by one whose personality has already endeared itself in the hearts of the British people. We may rejoice in the knowledge that Princess Elizabeth, as Queen, will ably maintain the traditions so cherished by her father, and, so far as aviation is concerned, that her manifest interest is linked with already extensive experience.

THIRTY HOURS AIRBORNE

Pen-picture of a B-36 Training Mission: Pre-flight and Handling Procedures



Crew stations in the B-36 forward compartment. The pressurized sections at each end of the fuselage have a combined volume of 3,924 cu ft—roughly a fifth of the total fuselage volume.

EVEN today, in the second half of the power-flying century, we have among us men who can remember having built, flown and maintained their own aeroplanes unaided. Since those leisurely days, aircraft have become progressively more complicated, and for a good many years now there have been types in service which have demanded quite large crews for their efficient operation, in spite of the parallel development of electronic "boxes of tricks" and automatic devices.

This increasing complexity is the natural order of things, both living and mechanical, and in the aeronautical sphere it has followed a fairly even progression. The introduction of the Convair B-36, however, has brought about drastic revision of many previous ideas concerning aircraft operation, and in some ways this 358,000-lb bomber may be said to make bigger demands upon its crew than has any preceding type. The truth of this assertion is well brought out in an article which recently appeared in *The Lamp*, a publication of the Standard Oil Co., of New Jersey, and which has provided the germ of the narrative that follows.

It is no exaggeration to describe the B-36, in its operational form, as the most complicated piece of machinery in the world. There is reputedly a saying prevalent among its crews that flying is possible only at night, since the check lists require twelve hours to read. This is not so far-fetched as it sounds, since the briefing for B-36 training flights is in fact always scheduled some twelve hours in advance of the take-off time. As an example of the sort of work for which the aircraft was designed, an account follows of a typical training mission.

Assuming that the aircraft—a B-36D—is to be airborne at 1700 hr, the crew will be given a call at around 0400 for briefing at 0600. The briefing will be attended by all the crewmen detailed for the operation; this soon produces a large audience, fifteen men being the minimum crew for each aircraft. The briefing will continue during most of the morning, the information being supplemented by printed books of orders and procedures for the particular trip. Most B-36 training operations consist of a closed-circuit flight, with dummy attacks at each turning point.

The attacks, and sections of each leg, will frequently be made at widely varying altitudes, in order to provide practice in both bombing and cruising under differing conditions. The usual height-limits are between fifteen and about forty-five thousand feet, and an average leg may be fifteen hundred miles; a B-36 may, however, be required to fly an uninterrupted Great Circle course of three or four thousand miles, and training flights frequently extend over a large part of the earth's surface.

This sort of global flying is bound to involve the aircraft in many kinds of weather conditions, thus adding to the value of the training: in fact, the B-36 is intended to approach targets under (or, more accurately, over) cover of a storm, with a view to reducing fighter opposition. After lunch—the last meal on the ground for perhaps a day and a half—the crew (and the flight engineer in particular) will carry out an inspection of their aircraft. This will involve rather more than the time-honoured check on removal of control-locks and pitot-head cover; oddly enough, those items will probably not be the crew's concern at all. The pre-flight examination will be finished by 1600 hr, when the crew, probably sixteen strong, will line-up beside their aircraft for inspection by its commander. This will occupy quite a time, each man having many items of personal equipment to be examined, as well as plenty of extraneous gear for his comfort and efficiency. The bulk of the crew will then enter the bomber through the nose hatch, and will climb up to their respective stations; five or six others will enter *via* a small circular hatch in the rear fuselage, which provides access to the pressurized section aft.

The general layout of the nose pressurized section is shown in the accompanying sketch. In the basic-design stage it became apparent that most of the flight instrumentation and controls would have to be on panels separate from those used by the pilots; this arrangement was dictated both by space conditions and by the fact that the two pilots simply would not have the time to handle the vast number of ancillary services.

The flight engineer, in one sense the most important man aboard, is, therefore, to be found in the midst of an array of equipment which includes several hundred fuel and power-plant controls and instruments—for both pistons and jets—atmosphere-control panels for the two pressurized fuselage sections, and numerous electrical service panels. The flight engineer is assisted by a deputy, and together they spend a very full sixty minutes settling in before take-off.

The six Wasp Majors are started as soon as possible, in order to provide full electrical power throughout the aircraft, and the pilot taxies from the dispersal on to the apron as soon as he receives permission. The piston engines are left idling until take-off time draws near. The commander checks with each member of the crew over the intercom in the usual fashion, to ensure that all is in order for the take-off. The aircraft taking part in the operation usually start at three-minute intervals and fly individually for at least the first leg of the trip.

The bomber is allowed to roll on to the runway under taxying power, complete directional control being maintained by the steerable nose-wheels; differential braking and use of throttles are both difficult and unnecessary. After the aircraft has been lined up the petal diaphragms over the intakes to the four J-47 turbojets are folded umbrella-fashion and the units run up to idling r.p.m.

Operational Procedure

When clearance has been obtained from the commander, the turbojets are opened up to take-off power—usually 96 per cent—and then the six Wasp Majors gradually follow suit. As full power is neared, the parking brake becomes insufficient to hold the aircraft, irrespective of wheel-skid. The take-off is not unduly protracted and the climb is abnormally steep; in fact, the ten power-plants seem to have no trouble at all in lifting the 170-odd tons of aircraft very rapidly, in contrast to the rather sluggish ascent of the old B-29. Climb to the first operational height will probably be made to a complex flight plan, in which the turbojets will be used at various stages.

A bomber of this size has to be given plenty of time to settle down into any flight condition, and several hundred miles will have been covered before a steady cruise is obtained. On our hypothetical training flight it is dark by this time and most of the crew are sleeping—in the six bunks aft, reached with the aid of a trolley running on the 85ft tracks in the magnesium-alloy catwalk or, more accurately, communication tunnel. The engineers and navigators, however, are busy with flight-planning, and someone is sure to be cooking.

In the steady cruising condition, a B-36D has an hourly operating cost of some 2,100 to 2,200 dollars, which explains the desirability of fitting in the maximum number of dummy bombing attacks and fighter-affiliation exercises during every flight. In fact, as far as possible, every B-36 is taken off at maximum weight, with loaded guns and cameras and a load of practice bombs made up to an operational weight with ballast; "dead" flying is cut to the minimum.

Bombing is performed individually, with all crewmen at action stations. The six hatches over the twin-20mm barbettes are slid open, and the guns brought forth from their recesses. The turbojets are then started and the "snap-action" bomb doors opened below each of the four bomb cells. The bomber is then ready for its run; the precise method of bombing from upwards of 40,000ft

The B-36D from Carswell A.F.B., Fort Worth, Texas, which recently finished a training mission in an English field, near Salisbury. Bearing no signs of damage from its forced landing, the bomber has the covers over the rear pair of turrets open, but the turbojets are closed up. Note the wake of earth thrown up by the bogies, which survived crossing a banked-up main road. The aircraft was later towed a few hundred yards to the Boscombe Down runway.

THIRTY HOURS AIRBORNE . . .

may not, of course, be mentioned, except to note that radar plays the governing role.

Before making an attack at one of the upper levels, the crew will have donned their high-altitude suits, which protect them against a sudden loss of pressure following an observation-panel blow-out or combat damage. Cabin heating may also be full on, since an ambient air temperature of −50 deg C, or less, is commonly encountered by these aircraft. If icing is met, no trouble should ensue: the anti-icing and defrosting system utilizes engine cooling air, which, passed through exhaust-gas heat-exchangers, is piped to the double skin of the wing and tail leading-edges, and to the double-glass sandwiches of the bombardiers' and pilots' enclosures and to the sighting bubbles.

As this hypothetical mission progresses the B-36 gradually gets lighter, as the fuel—the same for all ten power plants—and oil are consumed, and the bomb load, real and simulated, is released. If power is lost on on one side, the turbojets on that side of the aircraft may be used continuously to reduce the assymetric component. The J-47s are actually brought into use by the pilot, everything else in the motive-power sphere being in the charge of the flight engineer. He must maintain the speed of the aircraft to within one mile per hour in any kind of weather and any condition of loading and power; bearing in mind the number of variables to be considered, this is no mean feat. Assistance is given by the numerous gunners and scanners, who watch for such things as fuel and oil leaks, icing, and loose pieces of panelling.

The final approach and landing is not abnormal, the weight by this time being about half that at take-off; in any case the huge electrically operated flaps allow a very steep and slow approach to be made, and the ten wheels spread the load over a considerable area. The turbojets may be kept at a fast idling speed on the approach, in case an overshoot has to be made, but their thrust is not essential.

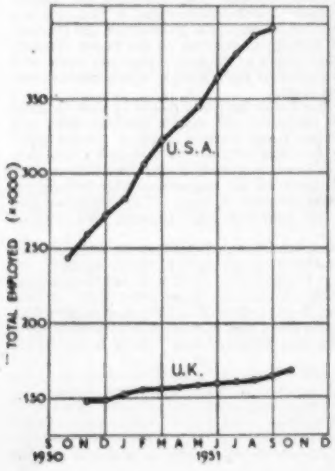
After their trip, of some thirty hours' duration—a reconnaissance RB-36D has remained airborne for over fifty hours—our crew probably feel very much in need of a rest; their conditions of work, however, are immeasurably better than those obtaining even in the best bombers of the late war, and automatic equipment performs a great many otherwise fatiguing tasks. In spite of all these "little black boxes", however, a B-36 crew probably need more slide-rules than the average design-office.

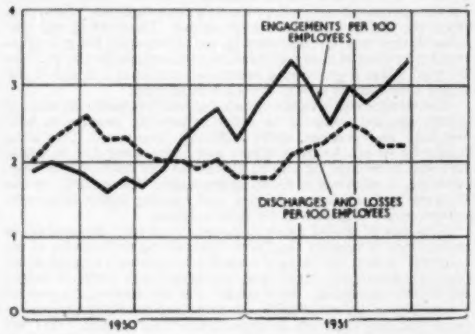
W.T.G.

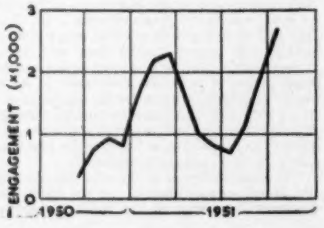
MANPOWER—GRAPHICALLY

BELIEVING that graphs speak louder than tables of figures, we present these pictorial representations of the fluctuation of manpower within the British aircraft industry. Compiled from information contained in Ministry of Labour and S.B.A.C. sources, they reveal a most disturbing comparison between the rates of growth of the U.S. industry and our own. The S.B.A.C. points out that in November 1951, the last month for which figures are available, the British industry achieved a net gain of one employee in every hundred. When it is realized that this increase was made up of three gains and two losses, the position is seen in its most depressing aspect.

A good deal has been said during recent weeks—in *Flight* and elsewhere—on the subject. A further view, expressed in a letter from a reader published last week, is that small engineering concerns are "pirating" skilled workers from the larger employers. If this is in fact happening—and we have reason to believe that it is—it may be a partial explanation of the "p.us-three-minus-two" tendency. In short, there is a new black market—in men rather than in materials.







(Above, right) British aircraft industry engagements and discharges during the past two years.

(Right) Monthly intake in the British industry.

(Left) Total labour force employed in the aircraft industries of Great Britain and the U.S.A. The difference in slope between the two curves is striking.

AIRWORK *serves the Sudan*

Airwork Limited provides aircraft and ancillary services for requirements outside the sphere of ordinary air-line operation. This is but one facet of an organisation brought into being for the service of aviation generally — an organisation comprising . . .

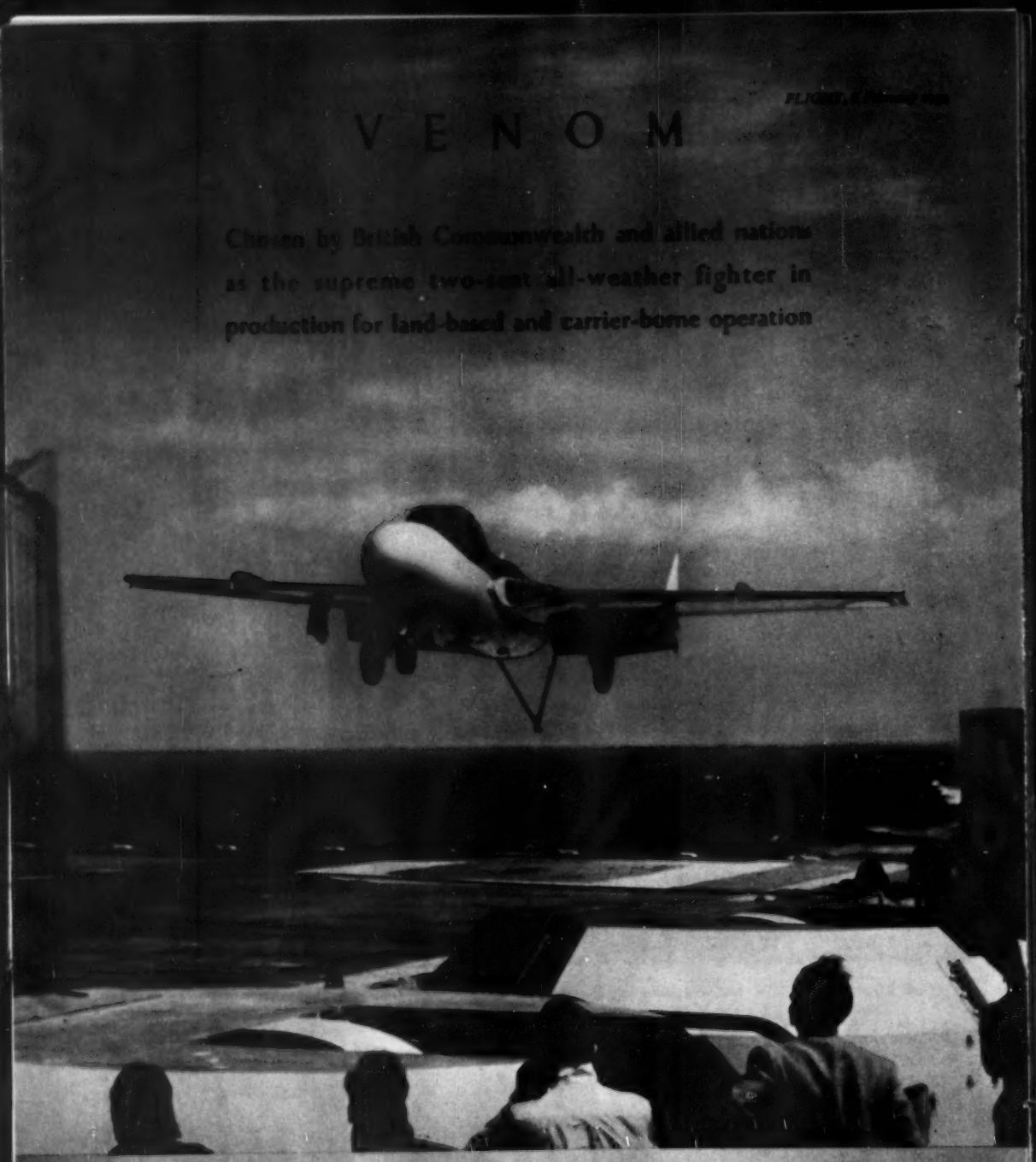
Air Transport Contracting • Servicing and Maintenance of Aircraft • Overhaul and Modification of Aircraft • Sale and Purchase of Aircraft • Operation and Management of Flying Schools and Clubs • Radio Sales and Service • Insurance

AIRWORK
LIMITED

AIRWORK LIMITED 15 CHESTERFIELD STREET LONDON W.1 TEL: GROSVENOR 4841

VENOM

Chosen by British Commonwealth and allied nations as the supreme two-seat all-weather fighter in production for land-based and carrier-borne operation



DE HAVILLAND

AIRCRAFT

ENGINES

Transferring hydrogen peroxide, by hand pump, from the main storage tanks to a refuelling trailer. The operators are wearing P.V.C. overalls and water from the hose in the foreground is allowed to flood the floor.

Refuelling a bench-mounted de Havilland Sprite rocket motor. The operator is attaching the trailer hose to the filler connection under the Sprite's peroxide tank; the adjacent union is the peroxide dump valve.

HANDLING HYDROGEN PEROXIDE

Characteristics of a "New" Fuel: How the D.H. Sprite is Serviced

BEFORE World War II, aircraft-engine fuel was invariably petrol, and quite ordinary petrol. During the last decade, however, numerous new fluids have become familiar to aircraft servicing crews—first came special high-octane petrols for heavily boosted piston engines; then methanol as an anti-detonant; nitrous oxide as a detonant and oxidant; and kerosene for gas turbines. Now hydrogen peroxide is coming into the picture, for use in rocket units. There is little published information concerning the bulk-handling of this chemical in high concentrations, since the aqueous solutions used for medicinal, cosmetic and industrial purposes are rarely of a higher concentration than 30 per cent. The peroxide used in rocket units is generally of some 80 or 90 per cent strength, and requires special precautions in handling.

Any rocket must, by definition, carry all the materials which form the jet efflux—typically, a fuel and an oxidant. Hydrogen peroxide is usually used as the oxidant, in conjunction with, perhaps, petrol or alcohol. In the de Havilland Sprite A.T.O. unit, only hydrogen peroxide is used by so-called cold reaction (500 deg C), its decomposition being accelerated by the use of a catalyst.

For the past two years, hydrogen peroxide has been handled in high concentration, and on a fairly large scale, by the de Havilland Company. It is a clear liquid, and is physically very similar to water, although denser (S.G. 1.35 at 80 per cent strength). Its manufacture in high purity (no easy task) has been undertaken in this country by the Laporte Chemical Co., of Luton, who, had a demand arisen in this country earlier, could have supplied high-strength peroxide as soon as their German competitors. The liquid decreases in strength, by some 1 per cent per year if it is perfectly stored, or by a greater amount in the tropics. This decomposition to water and oxygen liberates heat, but not so quickly as to cause danger or difficulty. This break-up is accelerated by contact with a number of metals, notably lead and copper. Unless specially prepared, steels and light alloys generally tend to act as mild catalysts; pure aluminium is quite inert. In this connection, it may be stressed that the dominant factor is the effect of the metal on the peroxide, not *vice versa*, although hydrogen peroxide is mildly corrosive to many substances.

The most suitable materials for storage tanks are pure aluminium, stainless steel, or an acceptable plastic. Tanks should generally be vented to permit the escape of the evolved oxygen, and a fine filter should be provided in the vent to trap dust and insects.

Any hydrogen peroxide storage-site should always have a plentiful supply of water available, since the peroxide becomes innocuous from all standpoints when diluted below 50 per cent.

A fire risk is introduced by the fact that the peroxide will decompose rapidly, with the evolution of oxygen and heat, if allowed to drip on to organic matter; this characteristic is the more dangerous by reason of the time-lag which may take place before fire actually occurs. The best guard against such an event is the maintenance of scrupulous cleanliness.

A further practice to be recommended is the use of self-sealing hoses, in order to keep the fluid "contained" during all transference operations. This, as the photographs show, is the procedure adopted in refuelling Sprite units. The peroxide is hand-pumped into a refuelling trailer, from which it is transferred to the rocket-unit by lightly pressurizing the trailer-tank; only just enough to fill the Sprite is dealt with at one time, to eliminate overfilling.

Splashes of concentrated peroxide can be painful to the skin, but are not dangerous. In any case, say de Havillands, use of P.V.C. plastic overalls and gloves should afford complete protection. In this connection, Mr. A. V. Cleaver, the company's special projects engineer responsible for the development of the Sprite, has recorded the only untoward incident that has so far arisen from the use of hydrogen peroxide at Hatfield: an assistant without overalls succeeded in setting fire to his trousers. Whether he adopted the time-honoured remedy of sitting in a bucket of water is not stated.

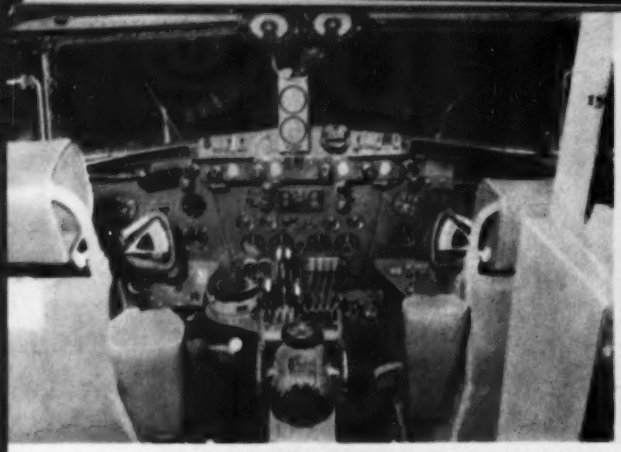
INFORMATION, PLEASE!

IT has been said that the possession of knowledge is less useful than knowing where the information may be found. Aeronautical engineers who follow this doctrine can supplement the facilities offered by the aviation Press and their own reference-books by utilizing two comprehensive information services. One is the *Index Aeronauticus*—the monthly review of technical articles compiled and issued by the Ministry of Supply. To quote from the introduction to each issue, "the primary purpose of *Index Aeronauticus* is to draw attention to articles of value in the world's technical Press in connection with aeronautical research, development, production and operation. Only notices of exceptional interest are selected. . . ." Vol. 8, No. 1 (January, 1952) contains classified abstracts from some two hundred recently published reports and articles, together with an index to the issues for the preceding six months. The Technical Information Bureau of the Ministry also prepares translations and bibliographies which are generally held available for reference or for transmission upon demand. In exceptional cases, the original abstracting publication is also on loan, for brief periods. Enquiries concerning the index should be addressed to: The Secretary, Ministry of Supply, Dept. TPA3/TIB, Thames House, Millbank, London, S.W.1.

The second source of information is Aslib—the organization formerly known as the Association of Special Libraries and Information Bureau (the "Bureau," we note, is officially singular). The Department of Scientific and Industrial Research, which maintains Aslib, has recently made a special grant in order to establish a consultant service. This is now available to advise those who are considering the establishment of special libraries and information services, and to assist the development of existing facilities. Details can be obtained from the Director, Aslib, 4 Palace Gate, London W.8.

GAS-TURBINE STEELS

IN the third edition of their periodical publication *Enchiridion*, Firth-Vickers Stainless Steels, Ltd., mention their creep-resistant gas-turbine alloys. Firth-Vickers 326 and 337 steels have been used in various forms, from blade stampings to large rotor forgings. Rex 448 is a new ferritic steel, particularly suitable for aircraft turbines, where temperatures are not sufficiently high to warrant the use of an austenitic steel. Rex 467, another recent development, is an austenitic steel with, it is stated, extremely good creep-resistance, in spite of the fact that it does not include the scarcer and more expensive alloying elements upon which high creep-resistance usually depends.



HASTINGS FOR NEW ZEALAND

Official Ceremony at Radlett Marks Delivery of the First C.3 Long-range Transport Aircraft

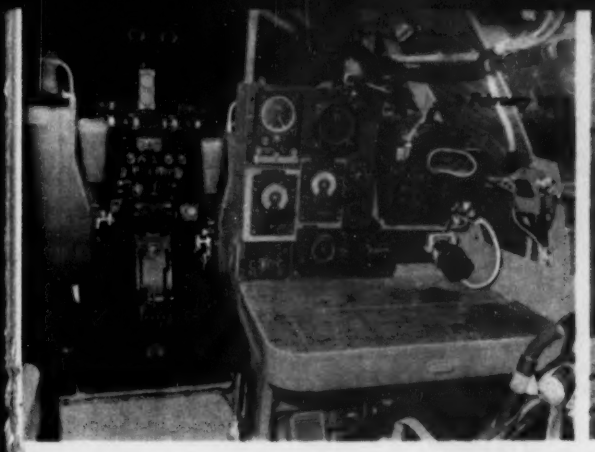
"FLIGHT" PHOTOGRAPHS

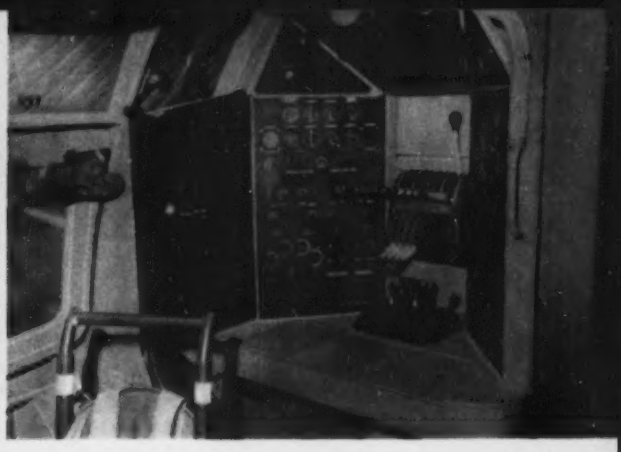
THE foggy winter morning which chilled the New Zealand Prime Minister and men of the R.N.Z.A.F. at Radlett on January 30th must have made them all the more anxious to climb aboard the first Hastings C.3 and take off for the warmth and sunshine of their own far-away country. Mr. S. G. Holland was present to receive officially from Sir Frederick Handley-Page the log-books of the first of four of these military transports ordered by the New Zealand Air Force.

R.A.F. Hastings are now handling a wide variety of duties and in particular they have been carrying reinforcements of men, weapons and materials to Singapore and Japan and returning over the 10,000-mile route as ambulances to bring home casualties from Korea and Malaya. Hastings, also, recently carried thousands of troops to the Suez Canal zone and evacuated Service families from the area. In addition these aircraft are operating with Coastal Command on weather patrols. As a trooper the Hastings C.3 will carry 50 seats, or as an ambulance 32 stretchers and 28 sitting cases. The payload for 1,535 miles at a cruising speed of 247 m.p.h. is over 20,000 lb for an all-up weight of 80,000 lb. The maximum range of 3,820 miles can be attained while carrying 7,100 lb of payload.

The selection of Hastings by the R.N.Z.A.F. is a step forward in the policy of standardization in aircraft and equipment among Commonwealth air forces. Mr. Holland said that the R.N.Z.A.F. intended to co-operate as closely as it could with the R.A.F.

Reference was made last week to the handing-over ceremony and, briefly, to the differences between the C.3 and the R.A.F. C.2 Hastings. In particular, attention was drawn to the improved take-off, climb and speed at lower





levels bestowed upon the C.3 by virtue of its Bristol Hercules 737s—single-stage radials of a type hitherto associated with civil installations. Mention was also made of the new Marconi radio equipment, now illustrated on these pages. The Hercules 737s produce 2,040 h.p. for take-off—some 275 h.p. more than the 106s fitted in C.2s—but the economical cruising rating is obtained at 10,750ft as compared with 13,250ft in low gear and 21,500ft in high gear for the 106s.

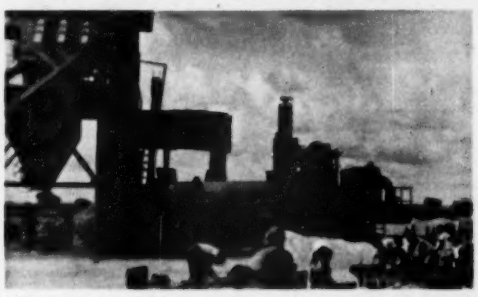
Two more aircraft are following close behind this first one to be delivered, and they are expected to fly out to New Zealand at approximately 14-day intervals, starting next week. The fourth machine of the order (which is the first to be placed by New Zealand for large military transports) will follow later. The New Zealand crew under F/L. C. L. Seigert, D.F.C., was present at the Radlett ceremony, and when they take off on the delivery flight they expect to be carrying 25 recruits from this country for their Air Force.

COCKPIT and crew stations of the Hastings C.3 are unusually attractive and well arranged. Left to right in the photographs above are seen the comfortable seats for the pilots, together with their controls and instrument panels; the radio operator's station with new Marconi equipment; the navigator's well-equipped table; and the engineer's panels and controls. Elsewhere on the page are photographs of the interior of the C.3 with seats folded along the fuselage sides and parachute rails in the roof; a view of the aircraft nose which shows the crew entry hatch and ladder and, more particularly, the Hercules 737 installations; and the first aircraft itself after the ceremony at Radlett airfield. In the group are seen Mr. S. G. Holland, C.H., New Zealand Prime Minister, on Sir Frederick Handley Page's left, and A. Cdre. C. E. Kay, C.B.E., D.F.C., Air Officer Commanding R.N.Z.A.F. H.Q. in London, on his right. With them are F/L. Seigert, D.F.C., some of his crew of No. 24 Commonwealth Squadron and other members of the Royal New Zealand Air Force.

Graders at work on one of the runway foundations: note the flatness of the distant countryside. The second picture shows (left to right) Sir Miles Thomas; Lt-Col. M. C. H. Barber, Southern Rhodesia's D.C.A.; Mr. J. H. Durr, chief airport construction engineer; Mr. H. Coxe, Deputy D.C.A.; Sir Ellis Robins, chairman of Central African Airways; Mr. J. S. Colman, construction engineer; and Mr. J. K. Smith, the works superintendent.

KENTUCKY FARM

On the Comet Route: Progress with a New Airport for Salisbury, Southern Rhodesia



Infernal machine: the big concrete-mixer and weigh-batcher at work on the site. The natives working in the foreground are convicts.

REFERENCE was made recently in *Flight* to the visit of Sir Miles Thomas, B.O.A.C.'s chairman, to Central and South Africa, and to the fact that he had discussions with Col. Sir Ellis Robins, D.S.O., chairman of the Central African Airways Corporation regarding trunk and tourist services and the new airport under construction near Salisbury, Southern Rhodesia.

On his return to this country Sir Miles sent us photographs, reproduced here, of his inspection of the progress which is being made at Kentucky Farm. He tells us that the 2,800-yd No. 1 runway will be suitable for the Comet, and that the approaches are excellent. We also learn that there is to be a 1,200-yd emergency over-run after the 2,800yd of paving, and a further cleared strip 800yd in length. There is a second (grass) runway of 1,500yd.

Kentucky Farm will eventually replace Belvedere Airport, Salisbury, the war-time training field that constitutes the present headquarters of C.A.A.C. The new airport will, it is hoped, be ready for operation at the end of the year, by which time the taxi tracks, main runway (due for completion by October) and hard standings will be available. Introduction of services may, however, be delayed by lack of buildings, and this matter is now under consideration. Eventually, certain of the regular Comet services to South Africa will be routed through Kentucky Farm to Johannesburg; the others will use Livingstone, as has already been announced.

TURBINE-BLADE FINISHING

A DRAWBACK to previous abrasive-belt methods of turbine-blade finishing has been the impossibility of producing a smooth curve down to a very small radius at the leading and trailing edges. The Pratt and Whitney aerofoil grinding machine (handled in this country by Alfred Herbert, Ltd., Coventry) generates the blade profile in the classic "gun-stock lathe" manner, with the addition of two new motions for twisted aerofoil shapes: (a) a sweep or swivelling of the grinding idler in order to present the belt tangentially to the instantaneous centre of the work, and (b) a compound feed-motion so timed that the belt will follow and finish the section adjacent to the base when this section is at the runner-cone angle from the general blade axis.

Using a finishing belt, a roughing pass will remove some 0.003in on a side per traverse, while a finishing pass takes off one-third as much; rough-milled blade blanks can be finished in two traverses: tip-to-root roughing, and root-to-tip finishing. Using a 12 per cent chrome-steel with reasonable machining, the final tolerance should, it is stated, certainly be within plus or minus 0.003in, with a smooth curve throughout.

As regards output, typical performance figures may be taken to be: traverse time (4½in at 0.125in lead and 25 r.p.m.), 1.44 min; grinding time (three traverses), 4.32 min; loading and unloading, 0.25 min; resulting cycle-time per blade, 4.57 min. On the basis of automatic handling, an operator could fairly easily mind seven of these machines with a combined output of 91 blades per hour.

A detailed description of the equipment appears in the February issue of our associated journal *Aircraft Production*.

JOHN COPPING: AN APPRECIATION

THE following appreciation of Mr. John Copping, of the Decca company, who lost his life in the recent M.C.A. Anson accident, is by a colleague of his:—

"John Copping's first job with Decca was on the construction of the English Chain, and he contributed to the rapid completion of that project with characteristic drive and enthusiasm. First and foremost, however, John was a navigator—trained in the exacting school of Coastal Command and long-range met. flights—and it was through a navigator's eyes that he viewed the whole process of adapting a new radio aid to the needs of present-day flying. The operational aspects of this process were his main concern with the company, and his contribution was all-important. As soon as aircraft started to use Decca he was quick to see the advantages of the "inverse lattice" technique, with which he put in many hours of flying, and to realize its potentialities as the basis of an automatic Flight Log. This goal he attacked with great determination at a time when a quite different approach to the problem of pilot-presented Decca was being pursued.

"Once the Flight Log development programme (that he did so much to initiate) was under way, John's attitude remained fundamentally that of a practical navigator determined to mould the new technique into a form truly acceptable by the standards of his craft. His practical and commercial work was aided by a wide knowledge of the international radio-navaid scene and his own views on all its aspects carried added weight through their sincerity and objectivity. He will be sadly missed by his many friends in the world of aviation-electronics."

C. P.

ALVIS

ALVIS LEONIDES

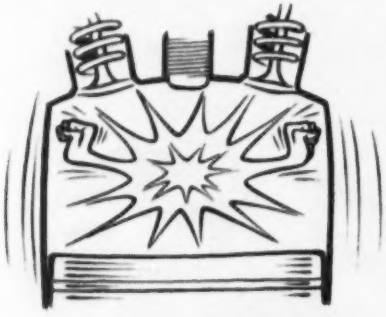
Chosen after competitive trials to power the Percival P.56 "Provost" the new basic trainer for the Royal Air Force

ALVIS LIMITED · COVENTRY · ENGLAND

No Tantrums or No Need to Knock

BY BERNARD HOLLOWOOD

THE next time my old bus does its *ping-pinging* act on our " hill " (it's one in 380 if it's an inch) I shall turn to my neighbour with an apologetic grin and say, " There she goes again—knock, knock, knock ! " I shall contrive to look very knowledgeable and exclaim, " Hear that? That's bad ! ! ! "



Knocking, you see, is a fashionable disease among internal combustion engines, and is sometimes referred to by engineers as " Detonation." There's all the difference in the world between headache and migraine, between sore toes and athlete's foot, between knock and detonation.

Even if they *do* mean roughly the same thing.

Let's have a proper definition—

KNOCKING : *In a petrol engine, the spontaneous combustion of part of the compressed charge after spark occurs, usually producing a characteristic sound, or knock.*

Knocking doesn't mean much to my old bus : I mean, if you consider the matter actuarially it *can't* mean much. But in a modern aircraft engine knocking can mean plenty : it *can* mean overheating throughout the engine unit, lubrication failure, burned cylinders, wrecked superchargers, cracked cylinder heads, melted pistons and a general decay of vital tissue. It *can* mean real trouble.

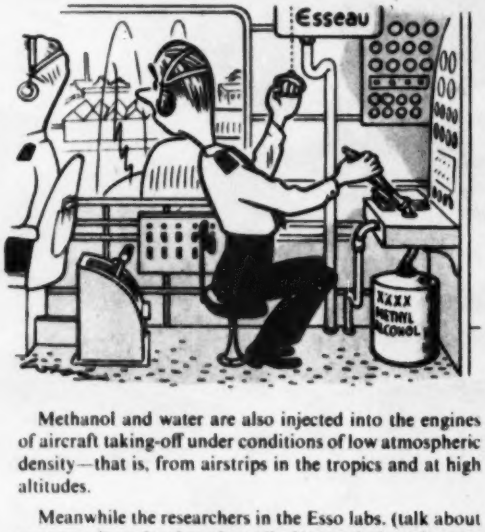
So knocking is something to be avoided.

Now the petrol used in the piston engine must be sweet enough to enable the engine to develop its designed power under all conditions—with the rich mixture used at take-off, and with the weak (or lean) mixture used for economical cruising. And the relationship between power at take-off and power at cruising-speed varies of course with the size, weight, design and load of the aircraft. With beauties like the Ambassador, the Viking and the Hermes the ratio of take-off power to cruising power is high, very high, and the demands on the juice used are also high, very high.

Airlines can only buy fuels that are (a) available and (b) reasonably priced, and it so happens that such fuels may only just meet the engine's requirements for weak (or lean) mixture cruising. If this is so, the safety margin against knocking under rich mixture take-off conditions may be pretty slender. In other words, there is a risk of detonation.

Fortunately, this risk of knocking can be eliminated.

This is done by feeding the engine with a cooling draught of Methyl Alcohol (Methanol) mixed with water while it is running at take-off power. Engines love it, cut out their tantrums and immediately adopt an air of sweet reasonableness. Or so I'm told.



Methanol and water are also injected into the engines of aircraft taking-off under conditions of low atmospheric density—that is, from airstrips in the tropics and at high altitudes.

Meanwhile the researchers in the Esso labs. (talk about tantrums !) are hard on the trail of better fuels and cooler cooling draughts—which is one good reason why

It pays to say

ESSO

FOR ALL PETROLEUM PRODUCTS

ESSO PETROLEUM COMPANY, LIMITED, 36 QUEEN ANNE'S GATE, LONDON, S.W.1

METAL OR WOOD?

Further Thoughts on the Quest for a Practicable Ultra-light Design

IN his article "Simplicity for Cheapness," which appeared in *Flight* of January 25th, "W.T.G." advocates the design of an ultra-light aircraft which can be produced cheaply, and in doing so voices the opinion of all those who wish to see private flying flourishing as it should. However, one feels some doubt as to whether his projected design for a suitable machine in this category would be as simple or as cheap as his article suggests. A design which is based on utilizing the minimum number of separate components will not necessarily turn out to be the best solution, and it can be shown that orthodox methods of construction will produce an aircraft which, at least as far as this country is concerned, will be less expensive as regards both manufacturing costs and maintenance.

The main factor to be considered in the design of the ultra-light aircraft will be the market for this type of machine, even supposing the layout to be so outstanding that all flying clubs and ultra-light enthusiasts felt compelled to possess at least one. To these could be added all who, although they are at present not participating in flying activities, would be induced to do so if a suitable machine were available. What would be a realistic figure for the number of machines which could be sold in this country? 500? 1,000? 2,000? Even accepting the last figure, which appears optimistic, surely W.T.G. would not consider this sufficient for the type of mass production he proposes, with its high initial outlay on tooling—which, as he rightly says, will be very costly. It seems clear that his price of £500 could not be achieved for these quantities when it is realized that the automobile industry cannot market cars at much less than this figure, although they are being produced in tens of thousands. Granted that the standard of internal furnishings will be austere compared with that of a modern car, the higher-class workmanship, materials and inspection required on the aircraft will offset any saving which may be expected in this direction.

If, therefore, mass production of this aircraft is impractical because of the quantities involved, a more orthodox type of construction would have to be employed. The possibilities are: (a) a light-alloy structure of a conventional type; (b) welded-steel tubular construction; or (c) a wooden structure.

Convincing arguments may be advanced for any one or a combination of the above methods, but it is the present authors' opinion that, when simplicity and cheapness of construction, maintenance and repair are considered there is no doubt that a wooden aeroplane has all the advantages; and an additional factor to be taken into account in these days is availability of material.

It is expected that the aircraft will be a single-seater and have a wing span of roughly 25ft, an all-up-weight of 800-1,000 lb, and a wing loading of about 10 lb/sq ft. The first problem is the choice of engine, which is rather restricted. A check on the existing range of suitable engines shows that something similar to the Praga D 75 h.p. flat twin is the ideal power unit on the basis of power : weight ratio and fuel consumption. An engine of this type, although heavier than the McCulloch flat four proposed by W.T.G., would not require any development to adapt it for use in the aircraft. The McCulloch engine, which is used on radio-controlled targets, runs on a petrol-oil mixture; this implies obvious disadvantages for the private owner.

From c.g. considerations, the wing as shown in the sketch accompanying W.T.G's article is obviously too far aft in relation to the pilot and engine considered together. If it is assumed that the main spar is roughly at the wing chordwise c.p. position, it becomes apparent that a conventional two-spar layout offers the best means of attaching the main legs of the tricycle undercarriage which must, of course, be behind the c.g. The leading edge as far back as the front spar would be ply-covered, forming a torsion box. Aft of this the wing would be fabric-covered, conventional type ribs being used to maintain the aerofoil section. This type of construction is easy to produce with the minimum of jigging, materials are readily available and any damage is very easily repaired without having recourse to riveting or metal working tools—a useful point to private owners and flying clubs.

The fuselage would consist basically of four wooden longerons with a lattice bracing. If cheapness is to be the main consideration, appearance must be sacrificed, and therefore only the minimum of fairing will be allowed; in the main, the fuselage fabric covering could be applied directly to the structural framework.

Tail surfaces will be of conventional layout, thus avoiding the complications of a gearbox required with the butterfly-tail arrangement. Construction, again, will be of wood and fabric.

The single-spring type of undercarriage is quite satisfactory, but in order to be efficient from the weight aspect the spring leg should be tapered, preferably in two directions. This gives rise to a rather difficult manufacturing problem; even then, this type of undercarriage is heavier than normal types. From the above, it is obvious that this weight penalty would have to be accepted for the sake of simplicity.

The form of construction outlined above will definitely show a considerable weight saving against that suggested by W.T.G., besides being much cheaper to produce in the quantities required. Although he does not specify any actual skin-panel thicknesses, it is obvious that he envisages something in the order of 16 s.w.g. at least. Due to the large unsupported panel sizes involved, this skin will buckle under bending and, therefore, the spar will be doing most of the work.

In conclusion, it should be pointed out that the guiding factor governing the design of any ultra-light aircraft will be the degree to which the Air Registration Board will be prepared to relax their existing Civil Airworthiness Requirements for aircraft in this category. Special requirements for ultra-light aircraft are being formulated, but it is not to be expected that they will be drastically different from those for normal aircraft, especially as far as crash-landing requirements and the basic flight envelope are concerned. Relaxations may be anticipated mainly in the requirements for structural stiffness for flutter prevention, gust requirements and allowable descent-rates for undercarriages.

F.W.V., E.B.C.

TAPED AND NAMED

UNTIL just before the war, that useful material commonly known as "transparent sticky tape" was an adjunct of home and office rather than of factory. Then the aircraft industry discovered new and valuable uses for it, and the demand grew prodigiously.

One specialist firm that responded to this need in 1939 was Offrex, Ltd., whose plain and coloured cellulose self-adhesive tape in due course became available with overprinting for the identification of wiring and piping. Later—in 1941—production of this material was taken over by Industrial Tapes, Ltd., now a member-company of the Offrex Group.

This firm has its own printing-plant for marking tapes. The identification tape which it supplies to the aircraft industry for identification purposes is known as "Bondex", and is of the double-ply laminated variety, in which the text is sandwiched, for protective purposes, between two layers of tape; large stocks are held, already printed with standard identification texts.

The makers state that their ethyl-cellulose tape has a high resistance to oil, petrol fumes, and other solvents, with a moisture vapour permeability of only 50 grammes per square metre per day, and also has a high degree of electrical resistance.

Apart from purposes of identification and coding, there is a demand for a variety of other types of tape. Paper masking-tape is employed for the protection of surfaces during spraying; "Speedfix" masking tape, it is stated, is particularly suitable for use over aircraft cellulose finishes, as the strong paper which forms the basic material is provided with a varnish coating prior to the application of the adhesive, which in turn is keyed by a special process in order to prevent any deposit after removal. The basic material is also creped for moulding to irregular surfaces.

If, however, a masking tape is required to be subjected to abnormal temperatures for long periods, or to be exposed to very rough handling, "Speedfix" cloth self-adhesive tape is available. It is precision-slit to eliminate frayed edges and prevent the adhesive oozing, and a filling process is applied to the cotton base (which is, necessarily, of a loose weave) to ensure that there can be no penetration. This tape is claimed to be ideal for holding purposes on the assembly line, as it has a tensile strength of between 30 and 40 lb per inch width and adhesive properties far greater than those of paper tape; and where a stronger tape is required for identification and coding purposes, cloth masking tape can be overprinted to specification.

All these tapes are A.I.D.-approved. Descriptive literature is obtainable from Industrial Tapes, Ltd., at Speedfix House, Dukes Road, London, W.C.1.

RADIO and TRAFFIC CONTROL

Abstracts from a Notable Lecture by an M.C.A. Specialist

DURING the fourth session of the 1951 Radio Convention, held at Southampton under the auspices of the British Institution of Radio Engineers, one of the most informative papers was that delivered by Mr. G. W. Stallibrass of the M.C.A.'s Directorate of Navigational Services (Control and Navigation). Abstracts from the first part of the Lecture are given here, and others will be included in a further instalment.

The author discusses the application of radio to certain navigational and air-traffic control problems which are now being encountered or are likely to arise in the foreseeable future. He introduces his subject by referring to the economic difficulties and international tension which have been responsible for creating the present melancholy situation in which most of the *en route* navigational and traffic control procedures throughout the world are still based on radio facilities that were recognized as being ready for replacement as long ago as 1947. The failure of certain new equipment to reach the standard of development originally envisaged and the realization of the high costs of providing numerous new installations have combined to introduce such an element of uncertainty that the absolute necessity of world-wide standardization on aids—at one time considered axiomatic—is now being re-examined.

The airlines themselves now have doubts of the economical justification of installing certain airborne equipment, the development of which has previously been strongly urged. In this paper the author reviews the present situation under the general headings of high and low density areas.

In high density areas [he said] a high proportion of services will be flown on short stages, there will be a density of traffic along a network of routes, and congestion may occur at the main airports. Navigation is no longer simply a problem of flying direct from one airport to another, but has become a matter of timing and routeing the flight, in accordance with a previously notified flight plan or the in-flight requirements of air traffic control. In short, the problems of navigation along the main routes have become inseparable from the requirements of an effective air traffic control system.

Limitations of Present Equipment

"En Route" Navigation.—On several European routes there are now corridors of controlled air-space known as airways, and aircraft desiring to fly within them under instrument flight rules must do so in accordance with an air traffic clearance specifying route, timing and altitudes. The radio ranges to mark them are medium-frequency radio ranges and M.F. non-directional beacons used in conjunction with automatic direction finders on the aircraft, although some aircraft still use Gee where cover is available. There are still some parts of Europe without airways, and others where their demarcation is by non-directional beacons only. The airways scheme which now serves major routes in the United Kingdom is marked by M.F. ranges. The fact that a shortage of frequencies on the M.F. band seriously restricts the number and power of M.F. installations is probably well known; but the feature which is of particular note is that, even when skilfully used, ranges and beacons by themselves can only give an indication of track and not of position. If an indication of position is required along a leg of a radio range, it requires the installation of a non-directional beacon or a V.H.F. fan marker. There is obviously a limit to the number of marker beacons that it is practicable to install and the use of non-directional beacons for this purpose is limited by the frequency difficulty just mentioned. This severely limits the position information obtainable from aircraft as they pass along the airways. So far as lateral tracking separation is concerned, beyond a distance of about 15 miles from the range station, it is practicable to establish two tracks in opposing directions by means of what is known as "right side separation"; but on the whole it is fair to say that, with airways marked by radio ranges, air traffic control cannot count on being able to give aircraft lateral separation wherever it is needed.

Within these limits, radio ranges can and do give very useful assistance. It is apparent, however, that their services cannot meet all requirements when two busy airways join and it is impracticable to assign vertical separation to a succession of aircraft passing through the junction point: when fast aircraft are overtaking slower aircraft and, at some stage, descending through their altitude to reach a holding pattern ahead of them: and when aircraft with long ascent and descent paths, such as the later models of certain piston-engined types and probably all turbine-engined aircraft, require to go through the successive altitudes of an airway steadily during a period of anything from 15 to 40 minutes.

Initial Approach.—For the initial approach from the airway to the holding pattern, the objective is to get the incoming aircraft into the lowest vacant altitude in the stack. Since the flight from the last reporting point should be short, the accuracy of the E.T.A. in the stack is generally fairly good; but there is need for an effective and foolproof means of checking that the assigned altitude in the stack will be vacant and of notifying this information to the air traffic control officer responsible for giving the aircraft clearance to the stack. Another problem is that, with existing navigational aids, aircraft departing from the airport have to be routed over the same facilities as those used for marking the holding pattern. This means that the lowest altitudes over the radio facility concerned will be reserved for departing aircraft, but, once past that facility, they will require to climb as rapidly as possible to their efficient operating altitude. This often requires passing through the altitudes of incoming aircraft and, even with a more flexible navigational system than radio ranges, radar surveillance of the air-space concerned is essential.

Holding Pattern.—Typical patterns are of a racecourse shape based either on two non-directional radio beacons or on a radio range with a non-directional or fan marker beacon situated a few miles along one leg from the range station. Present navigational aids do not enable aircraft to maintain their assigned stack-leaving times with sufficient accuracy, mainly because the pilots can only know exactly where they are twice during each pattern, i.e. when they are passing over one or other of the beacons concerned. The performance noted from radar observations taken so far may improve as aircrews obtain further experience on the system; but, at present, allowance has to be made for leaving errors to vary between one minute early and nearly one and a half minutes late. Many errors will be less than this, but, on occasions, they will be more.

Intermediate Flight from Holding Pattern to "Gate."—Various methods have been pursued to take out the effect of these variations and to achieve a smooth flow. The G.R.S. Timer, an American system which required all aircraft to be fitted with twin A.D.F., was withdrawn from use at La Guardia Airport a few months ago, reputedly because it contributed delay to the operation of control rather than reducing it. Presumably this means that, when traffic was dense and the controller was most busy, he had no time to feed in the wind speeds and air speeds and operate the equipment. The Americans have recently started to use surveillance radar at New York, which is of interest since we ourselves began using surveillance radar for controlling aircraft from the stack some two years ago. The landing systems in use at London and Northolt are designed to take advantage of the fact that, with radar, control can see when an aircraft leaves a stack and can assign it one of a number of flight paths from stack to "gate" whose variations in length will reduce the effect on runway arrival of errors in stack-leaving times. These tracks are precomputed to give the desired variations and the aircraft is assigned the one appropriate to the particular variation required. They can also be used to reduce the effects of wide variations in approach speeds, but cannot eliminate them entirely since the approach speeds of different aircraft types vary by as much as 60 knots in extreme instances.

A remaining difficulty is that when an aircraft has been given a selected track to fly from stack to "gate" there are still appreciable variations between the actual and estimated times taken by aircraft to cover even this short distance. Over a period of about 6½ minutes' flying the variations may be as much as a minute. At the moment there is no available computer that will enable the controller to give changes of heading during the intermediate stage in order to meet these final variations. This problem is one of a number now receiving attention.

Final Approach.—On the final approach phase the traffic control problem arises from the fact that operators of large aircraft prefer to have a straight-in final approach of not less than six nautical miles in order to give the pilots time to settle down on their various instruments, including I.L.S. localizer and glide path receivers, and to complete their preliminary landing drill. The navigational problem, as distinct from the control one, is to provide an aid on which it is practicable for the pilot to approach the runway confidently and accurately down to a low altitude. Present practice has shown that, used in conjunction with good approach lighting systems, either well-operated G.C.A. or I.L.S. equipment is reasonably adequate for this, and the

demand on the pilot can be very greatly reduced by instruments of the Zero Reader type.

Surface Movement.—The size of large airports makes it impracticable to control the flow of aircraft between the runways and dispersal and loading points on the airport by visual means from a central point. In the United Kingdom a system has been developed known as the ground traffic indicator which is being tried out at London Airport. Actuated by magnetic detector coils in the taxi-ways and runways, it provides the surface-movement controller with information on a "mimic" illuminated display of the airport system and enables him to clear aircraft on the block signalling system. His instructions are passed to the aircraft by illuminated traffic signals sited alongside strategic points on the taxi-tracks. An alternative line of approach, also being pursued in the U.K. and U.S.A., is to apply radar surveillance to this problem. Experiments are being carried out this summer at London Airport, using a Marine Radar Equipment operating on three centimetres. Final consideration of the relative merits of the two systems cannot be made until investigations have proceeded further.

Equipment is needed for guiding aircraft with sufficient accuracy for them to find and follow taxi-ways rapidly, and with ease in very low visibility. Not much can be said on this point except that experiments have been conducted for several years with leader cables buried below the surface of a taxi-track or runway, and that no means has yet been produced that would be acceptable and practicable for civil aviation.

Requirements for the future

So far [continued Mr. Stallibrass] this paper has dwelt more on problems arising from the present situation and the limitations of existing equipment. It would be a mistake to infer from this either that the existing facilities are bad in themselves or that the overall situation is very unsatisfactory. In fact, although much more needs to be done, particularly in certain parts of Europe, the airways system recently introduced in the U.K. works very much better than anything available here before and landing rates in bad visibility at the more important airports are increasing steadily.

The first basic requirement [in solving *en route* problems] is for a navigational system that will provide aircraft with continuous information of their position, presented in such a form that they can make good any track laid down without the need for careful calculation and without requiring the presence of a specialist navigator among the crew.

The two most likely contenders for selection as the new navigational system are the V.H.F. omni-directional range (V.O.R.) on 112-118 mc/s, together with distance measuring equipment (D.M.E.) on 1,000 mc/s; and the Decca system of hyperbolic navigation incorporating the automatic flight log and operating on low frequencies (100 kc/s).

V.O.R. has been recommended by I.C.A.O. as a standard aid "in localities where conditions of traffic density and low visibility necessitate a short distance aid to navigation for the efficient exercise of air traffic control." The United Kingdom dissented from this recommendation as it doubted the adequacy of V.O.R. for this purpose, and these doubts have since been confirmed by the inaccuracies disclosed by extensive trials in the United States and by examination of the costs of providing V.O.R./D.M.E. on the scale required in Europe. For these reasons at the recent meeting of the I.C.A.O., C.O.M. division, the U.K. took a leading part in discussing the advances that have recently been made in the development and application of Decca, and this resulted in a recommendation that the system should be further examined and evaluated operationally, preferably in the European region when so much cover already existed.

Broadly speaking, the advantages offered by Decca are greater accuracy and cover, pictorial presentation, about two-thirds of the cost to authorities supplying ground installations and availability for shipping purposes. On the airborne side it may be about half the cost and a little over half the weight of corresponding equipment for V.O.R./D.M.E.

The first need is for the navigational aid to enable aircraft either to be given separate tracks for a good deal of the flight or to be put on to a separate track while they are changing altitude, after which they can come back to the "centre-line" track again. This, however, only solves a part of the problem. At some point aircraft bound for the same destination have to be re-concentrated, and, even with a good navigational aid, the constant position reporting needed for this and for dealing with aircraft crossing or joining the airways throws a heavy load on the R/T. communications. This leads naturally to a consideration of the role of surveillance radar.

The first limitation is that the basic display on present types of radar—a plan position indicator—displays the positions of the aircraft as blips, without identificaion. Thus, the long-term requirement is for aircraft to carry radar transponders that transmit their identity in code, either continuously or when interrogated. In practice, this is likely to prove very difficult. One problem arises from the difficulty of supplying full coded information on a P.P.I. without cluttering up the display. Others lie in the choice of the interrogating/reply frequencies. The M.C.A. is beginning by experiments with a simple transponder, which could be operated by the pilot on request and would mark his particular blip distinctively on the P.P.I. for so long as he kept the transponder in operation.

Another need is for the accurate determination of height. Radar height-finders currently in use rely on measurement of angles and distance. A slight error in the angular measurement becomes quantitatively more serious as the distance increases between aircraft and height-finder; and, except at fairly short ranges, the accuracies of present height-finders restrict their application mainly to assisting in identification and to preventing directions for unnecessary avoiding action by aircraft that are, in fact, separated by some thousands of feet. The answer to the accuracy problem is not easy, although one idea is for a transponder which, coupled to a barometric capsule, would transmit continuous identification of height as well as identity. However, this would be a very complicated apparatus if one considers that indication of 500-ft levels over present operating heights might require 70-80 height codes, in addition to the coding required for identification purposes. This problem is still under review, but a successful solution does not appear likely in the near future.

Apart from the need for better height-finding and identification facilities, a full return from the employment of radar requires better methods of displaying and applying the information derived from it. At the moment information in the traffic control centre dealing, for example, with a stretch of airways, is derived from two sources. First, there is what is termed the "procedural" information, which is derived from a flight plan and an air traffic control clearance assigning particular altitudes and times at reporting points to each aircraft. These are checked and amended from time to time as position reports are received from the aircraft and are displayed by means of written flight progress strips on a flight progress board. The operation of this naturally requires a reasonable amount of light. Second, there is the radar information, at present confined to the P.P.I., which has to be viewed in obscurity since there is still no certainty of the long-promised daylight viewing tube. In the absence of an effective means of "marrying" the two types of information so that both are available to a single controller, the present emphasis in long-distance radar work has to be on dealing with a minority of situations involving closer separation and on monitoring traffic against untoward incidents, leaving the basic separation minima as required for a procedural system, rather than in speeding up the entire traffic flow by relying primarily on information "taken off the tube." This problem requires urgent attention, and it should be possible to learn a good deal more when the "procedural" air traffic control centre now at Uxbridge is transferred to London Airport and occupies the same accommodation as London Radar.

The functions of surveillance radar for approach control may be defined as :—

(1) To give aircraft navigational assistance in positioning themselves for final approach.

(2) To monitor the terminal airspace against "intruders."

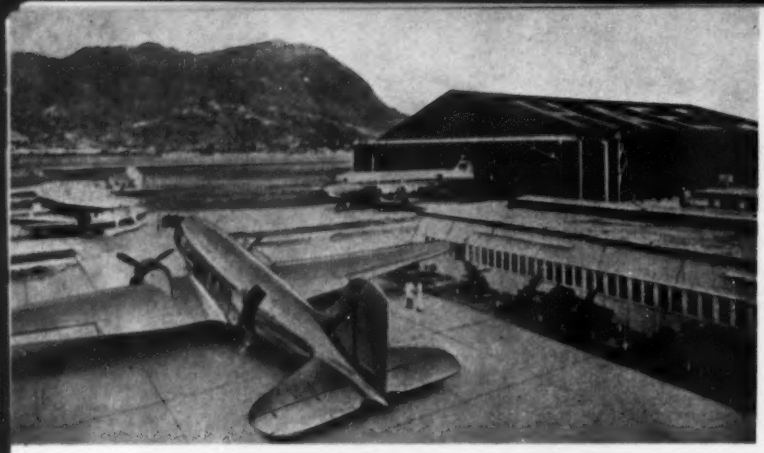
(3) To marshal aircraft from holding patterns to final in order to secure a well-spaced traffic flow.

(4) To monitor aircraft on their take-off paths in order to reduce the separation required between aircraft outbound from an airport and those in the holding pattern or on final approach.

Judged by this, the present Federal G.C.A. equipment (as installed at London Airport) has serious limitations in that its vertical cover is cut off at about 4,000ft and it is subject to interference from permanent echoes. The I.C.A.O. specification for what is termed Surveillance Radar Element (S.R.E.) was based on the old conception that this should be primarily an adjunct to the radar approach system. The cover specified is not adequate for the application of this equipment to air traffic control, either in altitude or range. The specifications laid down for new British radar equipment (approach control radar) went further than this and provided for cover to extend up to 10,000ft at about 20 miles. It also includes permanent echo cancellation, and there is little doubt that equipment similar to or better than this will be essential for improved landing rates in future.

At the moment it is assumed that ultimately either some form of "daylight viewing" radar tube will be produced or that the intensities of lighting in different parts of the control room will be so varied that the approach, aerodrome and radar control will be integrated in the same accommodation. Since the new control accommodation to be erected at London Airport, for example, will obviously have to be usable for many years, these assumptions have serious repercussions. Nevertheless, it is pretty clear that these controls must be integrated for ultimate efficiency and that the display problems mentioned will have to be overcome.

(To be concluded)



A Note on the Work of a Servicing Organization at Kai Tak, Hong Kong

Part of the H.A.E.C. site on the edge of Kai Tak airfield. A Qantas DC-4 is standing at the entrance to one of the airframe-servicing hangars; a PBY-5A Canso is seen on the left.

FAR-EAST MAINTENANCE

KAI TAK airfield, well known to thousands of Service personnel as the headquarters of R.A.F. Hong Kong, is the home of one of the most efficient aircraft-servicing organizations in the Far East. This establishment, operated by the Hong Kong Aircraft Engineering Co., Ltd., is little heard of in this country, although it is familiar to many airline pilots—including those of B.O.A.C.—and is a British concern.

The fact that the whole East Asiatic seaboard is characterized by the combination of poor surface communications and vast distances has encouraged a rapid expansion of air traffic in this area. Hong Kong, by virtue of its geographical position and British sovereignty, long ago became one of the world's chief aerial centres, and the demand for an aircraft servicing and overhaul base arose early. H.A.E.C. was formed to meet this need by a pooling of British shipping and air interests, not only to fulfil local requirements, but also to provide a complete overhaul service for all civil aircraft in South-East Asia, and for passing airliners on trunk routes.

Although the company is managed by a British staff, the personnel are cosmopolitan; technical supervision is in the hands of licensed aircraft engineers from the United Kingdom, Australia and the U.S.A., while the servicing crews are drawn from all over the world. Selection of employees has, however, been carefully made, and the company claims that its staff compares favourably in efficiency with that of any comparable organization.

H.A.E.C. provides service not only for charter firms, but also for regular airlines operating through Hong Kong, of which there are fourteen at the time of writing. The type of service varies according to requirements, but in some cases includes complete major overhaul.

Airframe overhauls and major repairs are regularly carried out on DC-3s, while other types recently dealt with include the DC-4 and Argonaut, PBY-5A Canso, C-46 Commando, and the Norseman, while many military aircraft—mainly Spitfires—have also been handled. The policy of servicing all components and accessories "under one roof" has paid dividends in both time and money, particularly with complete overhauls of large aircraft.

Special shops are equipped for the servicing of radio and radar equipment, electrical services, engines, airscrews, and instruments, and in each of them the fullest testing apparatus has been installed. Supplying these shops is a stores building with 24,000 sq ft of floor space, in which are held airframe, engine and accessory parts, and—in separate sections—customers' own spares and commercial products. A special technical records section maintains an up-to-date library of orders, manuals and modification sheets for a wide range of aircraft, while the servicing process is completed by full certification and documentation, which is available for every item handled.

Finally, in addition to work carried out at Kai Tak, the company provides a number of field service teams, who will undertake emergency repairs in all parts of the Far East in which they are permitted to travel.

Apart from the maintenance of airliners flying on scheduled services, a great deal of additional work has recently arisen in connection with the increasing military operations in the area. H.A.E.C. is at present engaged, for instance, upon servicing aircraft taking part in the airlifts to Korea and Indo-China. In the case of Indo-China, quite considerable military air-dropping operations are taking place, with the use of commercial Douglas C-47s—nearly all of which come to Hong Kong for major overhaul.

HELICOPTER CABLE-LAYING

COMMENTING, for our information, on the possibilities of the helicopter for cable-laying duties, a member of the staff of Westland Aircraft, Ltd., remarks that the laying of military telephone cable, apart from short lines laid by local signal companies, demands the use of considerable weights of cable—more than can be carried by any helicopter at present in British service. The S.55, however, can lay up to one ton of cable, which represents over fourteen miles of standard R.E. telephone wire, complete on six reels.

SYNTHETIC ADHESIVES: HOW AND WHY

LAST year a Summer School was held by Aero Research, Ltd., of Duxford, Cambridge, at which a series of lectures was presented dealing with the technology of synthetic resin adhesives.

The lectures have now been preserved in book form*. They cover every major aspect of the theory and practice of adhesives in industry, and the treatment is such that the reader with elementary engineering experience, but no familiarity with adhesives, will be able to follow each chapter without difficulty.

The introductory lectures are designed to give the layman a sound basic knowledge of the mechanism and chemistry of the subject, and an appreciation of the properties of synthetic resin adhesives. Then follow ten papers, originally intended principally for persons employed in the woodworking industry, in which are discussed new techniques in the preparation and gluing of veneers and plywood. The five final lectures concern the use of adhesives in the engineering industries and particularly in the manufacture of aircraft and of electrical and allied equipment. Among them may be mentioned *Design for Redux*, by H. Giddings of the Bristol Aeroplane Co., and *Processes Used in Bonding Metals*, by F. H. Parker, of the Fairey Aviation Co.

Printed on art paper, the book is profusely illustrated, and its value is increased by a full bibliography at the end of each chapter.

Perhaps the only criticism we would make is the fact that there are pages in which it becomes apparent that a good lecture does not necessarily make a good chapter in a book. A little judicious quality-control of the lecturers' syntax and punctuation would have been appropriate to the Aero Research reputation—though a very apt classical quotation on the title-page suggests that the fact may already have been realized.

* "*Structural Adhesives—the Theory and Practice of Gluing with Synthetic Resins.*" *Published at £1 1s by Lange, Maxwell and Springer, Ltd., 41-45 Neal Street, London, W.C.2.*

FIFTY YEARS OF NICKEL

NOBODY associated with gas-turbine work will need an introduction to Nimonic alloys, which have played such a large part in enabling designers to exploit the full possibilities of this type of power unit. These alloys were developed during the war by the Mond Nickel Co., which has now completed the first fifty years of its life. Ludwig Mond, in 1890, was one of the original discoverers of the carbonyl process for nickel refining that has ever since borne his name, though there is now no Mond in the company.

The fifty years' history of the concern is recorded in *The Story of Mond Nickel*, a book now being circulated to the company's customers and friends; particularly praiseworthy are Eric Fraser's pen-and-ink portraits of personalities in the story.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Helicopter History

I READ the paper "Helicopter History," by Mr. L. H. Hayward in the January 18th and 25th issues of *Flight*, with much interest. I would, however, like to comment on his "sketch by an unknown inventor of 1860" (Fig. 1, page 66).

The sketch is, in fact, based on a working model of a helicopter —or rather an aeolipile fitted with helicopter blades—built by Phillips in 1840. The model actually worked, using only steam as a means of motivation, and was successfully demonstrated in Paris in 1842. It was reported to be made of metal and to have weighed about 2 lb. Actual figures on the performances are not given, but it is reported that the helicopter "rose to some considerable height, and travelled a long distance horizontally before it touched the ground again."

Phillips did not make the sketch; it was produced some years after the successful demonstrations in Paris, more in the form of a caricature than an inventor's vision.

R.A.F., Booker. H. A. SMITH, F/L.

Mountaineering

MR. HAIMES'S article on "Peaks and Parachutes" is timely. But why stop at aerial transport to the base camp?

I suggest that a helicopter (with specially developed rotor blades) be employed to deposit a reconnaissance party on the summit of Everest, when there should be little difficulty in prospecting a route for the more laborious method of ascent! The helicopter could be towed, auto-rotating, by Dakota to the base camp, from which it could make the short trips under its own power.

Port Erin, I.o.M. ALAN J. SOUTHWARD.

[But Everest is 29,141ft high, whereas the present helicopter height record (Capt. H. D. Gaddis, Sikorsky S-52, Bridgeport, Conn., May 21st, 1949) is 21,220ft. without any load.—ED.]

A 1910 Collision

HAVING been *méchanicien et interprète* in 1910 to Capt. Bertram Dickson (mentioned by Geoffrey Dorman in *Flight* of January 4th), I would like to have my little say. The main cause of the Milan crash was that the Farman had a bad direct-upward view for the pilot and the Antoinette a bad direct-downward one. Capt. Dickson was in hospital in Italy for a considerable time, although his relatives wanted to get him back to this country; if my memory is correct, he became on his return a technical engineer and adviser to the British and Colonial Aeroplane Co., now the Bristol Aeroplane Co. It is true Capt. Dickson never fully recovered and died three years later, as Mr. Dorman states.

I was at Lanark with Capt. Dickson when (as mentioned in Mr. Kappey's letter of January 25th) Mr. C. G. Grey was taken as passenger and both had to walk back to the hangars after the machine was seriously "bent." His chief mechanic, Marcel Fremery, and his wife and the writer spent two or three days, working day and night, to get the machine repaired to fly again during the meeting, for big money prizes were at stake in those days (the Bournemouth 1910 meeting was also a case in point).

Mechanics in those days mostly slept alongside their machines in the hangars and they always wore rubber plimsoll shoes, as the machines were so delicate.

It was your late editor, Mr. Stanley Spooner, who put me in touch with Capt. Dickson through a firm of insurance brokers, Lancelot Gibbs, at 166 Piccadilly, where I met the Captain and was "signed on." He was a charming man. I flew with him on two different occasions, including the famous shutting-off of the Gnome engine and *vol piané* to the aerodrome, this was performed from a very good height for those days.

Bristol. HAROLD SOLOMON.

A Brooklands Memory

A RECENT case that recalled Maj. Draper's 1931 flight under the Tower Bridge also brings to mind the fact that Maj. Draper once flew a Sopwith 1½-strutter under the footbridge over Brooklands Track—in order to get even with Hawker, who had flown a Pup under the same bridge in 1916.

Canada. STANLEY M. UDALE.

From South America

I READ with interest your recent reference to the fact that the Royal Singapore Flying Club flew 2,000hr during the first ten months of last year, implying that this is an average higher than that of most of your own clubs.

I am very proud of the airmindedness of my people and I would like to let you know that we had, in 1949 (the latest figures available), 238 civilian flying schools with 1,014 aircraft, which flew 109,961hr. In March, 1951, we had 8,678 civilian pilots. Last year the Aero Club of Pernambuco flew 6,500hr with a fleet of 22 aircraft, which have been flown by 32 pilots.

In the field of commercial aviation we have the longest domestic routes in the world. Some of our airlines go overseas in competition with B.O.A.C., Pan American, K.L.M., Air France, etc.

I think that our civil aviation has a really good record and I believe it to be the result of the very good support that we have received from our Government for the last 12 years. It should be noted that every engine and spare is imported.

Natal, Brazil. GRACO M. ALVES.

History Repeats Itself

I WAS very interested in an article in your January 4th issue—"The Navy's New Catapult"—for, from the description of the system, it appears that the basic principle is that which was the subject of a railway experiment carried out over a hundred years ago on a section of the Grand Surrey Iron Railway, which ran from Croydon to Wandsworth and was opened in 1801, first of all using horse traction.

A pipe with a slit running along the top was laid between the rails, connecting at intervals with air compressors (presumably steam-operated) at the side of the track. In this pipe moved a piston, joined to the trucks by a rod running in the slit. This was sealed by overlapping leather flaps, and the train was propelled (in theory) by exhausting the pipe of air forward of the driving truck while pumping in compressed air to the rear.

The drawback with this rather primitive system was that the railway engineers presumably did not possess the Navy's "novel sealing device"—far too much air escaped through the slit, and the working section was too long to allow enough air to be either evacuated or compressed.

I wonder if any of Naval Aviation's boffins had been reading railway history recently—or is this another case of history repeating itself?

R.A.F., Innsworth, Glos. A. N. SMITH, Cpl.

FORTHCOMING EVENTS

Feb. 11. Institute of Transport: Brancker Memorial Lecture: "The Flying-boat and its Place in Aviation," by Air Chief Marshal Sir Frederick Bowhill, G.B.E., K.C.B., C.M.G., D.S.O.

Feb. 12. R.Ae.S. Section Lecture: "Flight-test Problems for Civil Aircraft," by B. P. Laight, B.Sc., A.F.R.Ae.S.

Feb. 12. R.Ae.C.: Film Show.

Feb. 13. Royal United Service Institution: "Long-range Jet Flying," by S/L. A. E. Callard, D.F.C.

Feb. 14. R.Ae.S. Graduates' and Students' Lecture: "Radar," by B. W. Hodlin, B.Sc.

Feb. 15. Institute of Navigation: "Navigation Aids for Military Aircraft," by S/L. D. Bower.

Feb. 19. R.Ae.S. Section Lecture: "Glider Design," by K. G. Wilkinson, B.Sc., D.I.C., A.F.R.Ae.S.

Feb. 20. Aircraft Recognition Society: "The Exploration of Space," by A. C. Clarke, B.Sc.

Feb. 20. British Institution of Radio Engineers: "Search Radar for Civil Aircraft," by P. L. Stride.

Feb. 21. R.Ae.S.: "Power Steering for Aircraft," by K. G. Hancock, B.Sc., A.F.R.Ae.S., and P. Person, M.A., A.F.R.Ae.S. (at Brough).

Feb. 21. R.Ae.C.: Courtenay Film Show.

Feb. 21. Aerodrome Owners' Association: Annual General Meeting.

Feb. 22. Helicopter Association: "Helicopter Power Plants," by A. Graham Forsyth, B.Sc., F.R.Ae.S.

Feb. 23. Society of Licensed Aircraft Engineers: Main Lecture: "Some of the Responsibilities and Problems of an Airworthiness Authority," by R. E. Hardingham, O.B.E., F.R.Ae.S., M.S.L.A.E.

Feb. 26. R.Ae.C.: Courtenay Film Show.

Feb. 26. R.Ae.S. Graduates' and Students' Lecture: Gliding and Meteorology Symposium.

Mar. 4. R.Ae.S. Section Lecture: "Bogie Undercarriages," by F. A. Cousins, B.Ae.E., A.F.R.Ae.S.

Mar. 6. R.Ae.S.: "A Study of Airport Noise," by J. D. Hayhurst, B.Sc.

Mar. 6. Institute of Metals: "Chromium and Chromium-rich Alloys, by Maj. P. L. Teed, F.R.Ae.S., M. Inst. Met.

Mar. 11. R.Ae.S. Graduates' and Students' Lecture: "An Introduction to Supersonics," by C. H. E. Warren, M.A., A.F.R.Ae.S.

Mar. 12. R.Ae.S.: Fifth Louis Blériot Lecture: "The Future of the Flying-boat," by H. Knowler, A.M.I.C.E., F.R.Ae.S. (in Paris).

Mar. 13. R.Ae.C.: Film Show.

THE AERONAUTICAL BOOKSHELF

Some Recent Publications — Mainly Technical

"The Night Sky 1952." Times Publishing Co., Ltd., London E.C.4. Price 2s 6d.

ASTRO-NAVIGATORS may like to see their stars less mathematically treated, as they are in this compact booklet. Clearly printed on card pages, it is a presentation of the monthly star maps which will appear in *The Times* during the year, together with appropriate observations from the paper's Astronomical Correspondent.

"Parachutes," by W. D. Brown, M.Sc. Sir Isaac Pitman and Sons, Ltd., Pitman House, Parker Street, Kingsway, London, W.C.2. Price 40s.

SO far as is known, this is the first book to have been published devoted entirely to parachutes. The author has been head of the British Parachute Section of the Royal Aircraft Establishment since its inception in 1942, and he traces in this very comprehensive work the history of the parachute from its infancy to the most modern developments. Detailed explanations of parachute aerodynamics are given, together with those factors which influence design, choice of materials, types of pack, methods of development and methods of testing.

"Modern European Helicopters," by A. H. Lukins, A.R.Ae.S. George Ronald, 2, Alfred Street, Oxford. Price 3s 6d.

THE author believes that aviation and politics are developing in parallel so fast that fixed-wing aircraft will soon be little more than guided missiles, with few civilian applications, and that it will be left to helicopters to cope with a growing public demand for short-range air services. His book shows how far European manufacturers have gone towards providing the necessary helicopters; and the picture is not inspiring.

Admittedly, the book went to press too soon to include the Bristol 173 and the Ariel III; but of the eight major types which Mr. Lukins has described and illustrated, only three are in production and two of these are of American design.

Modern European Helicopters is a rather thin three-and-sixpence worth, but contains quite comprehensive data on the major types described in the body of the book, plus some excellent pencil drawings of historical European helicopters.

"Airplane Aerodynamics," by D. O. Dommasch, S. S. Sherby and T. F. Connolly. Pitman. Price 40s.

THIS book, which was first published in the U.S.A., began as a compilation of material covered in lectures delivered during the academic phase of the course at the Test Pilot Training Division of the United States Naval Air Test Centre. In the instruction of pilots who already had some association with recent types of naval or military aircraft, it appeared desirable to go beyond the fundamentals of fluid mechanics and dynamics, and to include in a single text such subjects as compressibility, modern control-system requirements, hydrodynamics, and others of current concern in the test programme. Although the text in its original inception was intended to reveal the methods of aeronautical engineering and was specifically addressed to pilots who were not aeronautical engineers, its emphasis on the relationship between academic theory and flight experience is believed to be particularly appropriate in any circumstances.

The book is designed with the fundamental purpose of creating an understanding of the "how" and "why" of modern aerodynamics: it is intended for students having a background in physics, mathematics, calculus, mechanics and dynamics. Although it is not, therefore, a treatise on mathematical methods, nor a handbook, the mathematical approach is used as necessary to ensure appropriate understanding, and sufficient practical data are given to ensure an integrated picture.

"Aeromodeller Annual 1951," Model Aeronautical Press, Ltd., Allen House, Newarke Street, Leicester. Price 10s.

THE contents of this annual underline some significant trends in the aeromodelling world. Among these tendencies, increasing complexity of models is to be expected; this is more than parallelled by full-size aircraft. Remarkable, however, is the atmosphere of internationalism and organization which now pervades the whole sport. The book names an aeromodelling governing body for every major country in the world, and also reports a number of international contests, in all of which Great Britain has at least held her own. All these contests are now flown by models built to the most strictly controlled specifications.

Certainly, this annual is not a catalogue of toys; rather do its pages read like a scientific report. Particularly noteworthy is the immense recent development in radio-control equipment, almost any desired unit now being available direct from maker's stocks. Great progress has also been made with control-line models and a special chapter deals with the superb multi-engined scale reproductions which have appeared at many public displays. Further progress is apparent with rocket propulsion units; these were accorded one page in the 1950 edition, but now have a chapter to themselves. Reciprocating-engine enthusiasts, will find a section analyzing bench-test performance of available piston-engines.

Engineering

"Pipe Resistance," by T. E. Beacham, B.Sc., A.C.G.I., M.Inst.C.E., M.I.Mech.E. Published by E. and F. N. Spon, Ltd., 15, Bedford Street, Strand, London, W.C.2. Price 18s.

EVEN in the aircraft industry, piping requirements are generally met by rule-of-thumb methods—an unsatisfactory state of affairs, since any pipe-flow equation contains a number of variables. This book is intended to provide a simple and accurate means of estimating pipe resistance for the flow of various liquids, It will be found simple to use, the pressure-loss being read direct from the appropriate resistance diagram.

"British Standard Handbook No. 13—Mechanical Tests for Metals." British Standards Institution, 24 Victoria Street, London S.W.1. Price 17s 6d.

ONE of the first tasks of the B.S.I. was to formulate a suitable series of standard tests for metals. Since that time a great number of B.S. mechanical-test specifications have been issued, together with a number of standard applications. They have now been collected to form this new handbook, which should be of considerable use to industry and technical colleges. The tests are divided into suitable sections, each quoting the relevant British Standards, and can be selected with the aid of an excellent index.

"Protection and Electro-Deposition of Metals." Published for the D.S.I.R. by His Majesty's Stationery Office, London. Price 30s (postage 1s 3d).

THE third volume of selected Government research reports, this new book contains reports, mostly unpublished previously, on work carried out during the war by M.A.P. and M.o.S.

The first part includes twenty reports dealing with the protection of steel and magnesium alloys, polishing of aluminium alloys, the study of intercrystalline attack and the operation of corrosion tests. Research into electroplating problems is covered in thirteen remaining reports. The use of zinc, nickel, cobalt, aluminium and selenium protective coatings is discussed, together with methods for determining the constituents of plating solutions, particularly in regard to traces of impurities.

Chemical and magnetic tests of the coating thickness are described, and one report gives details of adhesion tests for use during inspection of plating.

Recreation

"Yachting World Annual, 1951-52" (Incorporating The Yachtsman's Annual). "Yachting World," Dorset House, Stamford Street, London, S.E.1. Price 30s (postage 1s).

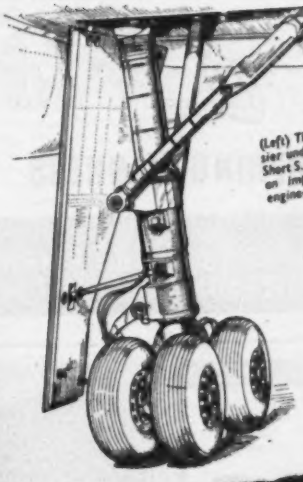
THE graceful sport of yachting, in which aerodynamics and hydrodynamics are so perfectly blended, is covered in all its aspects by this well-known annual. The new issue includes a complete record of all yachting activities of the 1951 season, together with a detailed survey of recent designs from the leading architects. Photography is superb throughout, while the plans of new craft are of the quality familiar to readers of the annual's parent journal.

"Motor Cycle Sport in Pictures." Published by The Motor Cycle, Dorset House, Stamford Street, London, S.E.1. Price 3s 6d (postage 3d.); or from booksellers.

BEARING the sub-title *Action Photographs of British and International Racing, Trials, Scrambles and Speedway Events*, this book of 9½ in. by 6¾ in. photogravure pictures would make an inexpensive and sure-to-please birthday present for all young motor-cycling enthusiasts—and for older ones also. By its very nature, motor-cycle sport is "photogenic," and the quality of the 60-odd pictures reproduced—many of them taken by *The Motor Cycle* staff photographers—bears out this assertion.

MESSIER *Landing Gear*

FROM FLIGHT SEPT. 21ST 1951



(Left) The towering Messier undercarriage of the Short S.A.4 jet bomber—an impressive piece of engineering.

FROM THE AEROPLANE SEPT. 21st 1951

Bogie-wheel undercarriages are becoming increasingly common at Farnborough, and the inward-retracting example on the Short SA.4 is a magnificent engineering achievement.

Twenty-three years experience in the design of hydraulic landing gear for aircraft is incorporated in every Messier undercarriage design.

BRITISH MESSIER LTD · GLOUCESTER

That isn't all plane sailing!

Is that an aircraft, or a hawk with hiccups? Ask the intrepid birdman in the cockpit! Even HIS confidence is shaken by the trail of nuts and bolts that follow in his wake. No doubt, at this very moment, he is putting a hasty patch on his parachute and praying for a one-piece landing.

What a pity he spurned the practice of wiser aeronauts and refused to fit "Jac" Spring Washers beneath nut. They never let a man down . . . however far! For all who swoop about in the cerulean blue, "Jac's" the boy to beat the jitters! For all who put aeroplanes together, "Jac" is the washer that keeps them that way.

Made in sizes to fit every standard bolt, their saw-tooth serrations give a positive lock that is unaffected by vibration and shock. Send for samples and details.

Jac

SPRING WASHERS

DAVID POWIS & SONS LTD. SPARKBROOK · B'HAM TELEPHONE · VICTORIA · 1264

MOULDED COMPONENTS (JABLO) LTD.

Tool Manufacturers & the Pioneers of Laminated Plastics

JABLO WORKS · WADDON · CROYDON · SURREY. Telephone: CROydon 2201. Telegrams: JABLO, CROYDON

CIVIL AVIATION

FLIGHT FROM EGYPT: This photograph of a busy scene at Wadi Halfa was secured when a B.O.A.C. Hermes landed there with only a half-an-hour's fuel on board after a hurried departure from Farouk Airport during the recent disturbances in Egypt.

U.S. AIR-SAFETY INQUIRY

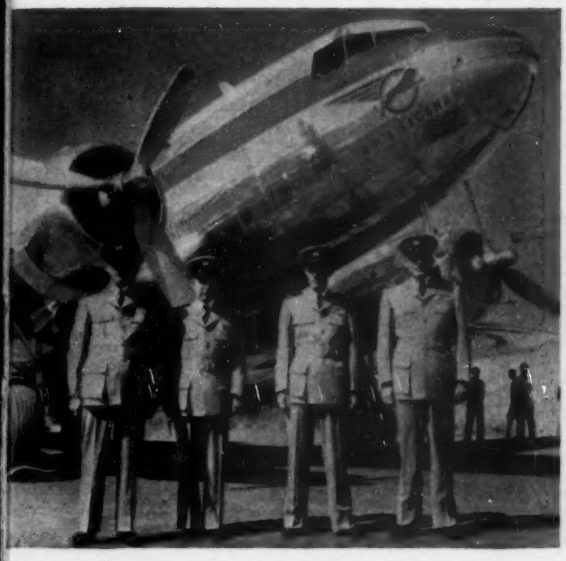
FOLLOWING the recent incidence of airline accidents in the United States, the House of Representatives has ordered a full-scale investigation into air-safety standards. A five-member sub-committee has been established to make the inquiry and all Government departments which make and enforce air-transport regulations have promised their full co-operation. The C.A.B. has announced that the inquiry will start almost immediately, so that members of the sub-committee will be able to witness the methods adopted by the Board's experts investigating the recent accident suffered by American Airlines at Newark Airport, near Elizabeth, New Jersey. It was the second to have occurred at Newark within five weeks: on December 16th, 1951, 56 people lost their lives when a C-46 crashed soon after take-off.

The committee will investigate all air regulations, pilot training programmes, airport equipment and location, aircraft maintenance and electronic landing aids. Particular attention will be paid to the question of moving Newark Airport to a better site. Since these accidents there have been continuing demands from the public that the airport should be moved because it is now located in a congested area.

On the question of U.S. air-safety generally, Mr. Donald Nyrop, chairman of the C.A.B., has pointed out to the committee that there has, in fact, been a steady improvement in the accident rate during recent years. It was better, he suggested, to review the problem in the light of achievement during successive five-year periods rather than study the results for single years. For example, non-scheduled airlines had a relatively poor record in 1951 because of two crashes in December which together caused 82 deaths. Had they happened a few days later, 1951 would have been a perfect year except for a single fatality which occurred during a military contract flight on November 5th.

C.A.B. statistics show that the scheduled airlines had a fatality rate of 1.4 persons per 100,000,000 passenger-miles in 1951, as compared with a figure of 1.2 for the previous year. Last year's rate for the non-scheduled operators is estimated at about 7.3 per 100,000,000. In 1951 there were 291 deaths among passengers and crews on American internal and international scheduled and non-scheduled airlines. These took place in a year when the companies carried a total of 25,000,000 passengers and flew more than 14,000 million passenger-miles, the busiest year in the history of the industry.

Although the scheduled airlines show higher fatality totals, their safety record is, nevertheless, better because, on internal routes alone, they flew more than ten times the passenger-mileage achieved by non-scheduled operators.



ANOTHER ROYAL CREW: The East African Airways Dakota "Sagana" will be used to fly T.R.H. Princess Elizabeth and the Duke of Edinburgh from Nanyuki to Mombasa at the end of their stay in Kenya and before they embark upon their Australian tour. Right to left in this group are W/C. A. N. Francombe, deputy manager of the Corporation; Capt. G. O. P. Watson; R/O. I. Morris (Radio); and Steward G. F. Mathews.

DAKOTAS FOR SALE

THE market for second-hand commercial aircraft changes very quickly, and although their disposal is unlikely to prove difficult, there will be no unholy rush for the Dakotas—the number is understood to be 30—put up for sale by the R.A.F. We learn that they are all standard freighters in good shape, though entirely without spares backing. There should be no difficulty in obtaining a C. of A. for any of these machines.

The sale involves certain restrictions, designed to retain the aircraft in the hands of operators who could be called upon in the event of a national emergency. Thus, one of the conditions is that there shall be no redisposal to foreign countries, even for dollars.

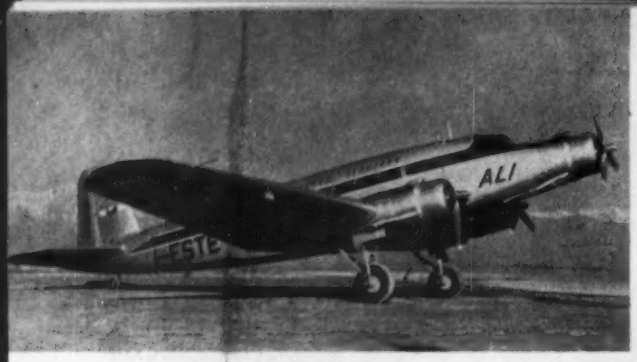
The Dakota spares position (particularly so far as the airframe is concerned) while not critical, is definitely sticky for most owners. There are a few operators, however, who laid in a good supply in the past and are therefore better placed.

It seems likely that the Corporations will have a go and, in fact, B.E.A. have already earmarked at least two of the machines. If others are permitted to be based overseas, some of B.O.A.C.'s associated companies would no doubt also like to have them—Middle East and African operators, for example.

Whether the disposal of Dakotas at this time indicates an improvement in the supply of new aircraft for Transport Command is undisclosed. If it does not, it seems at first thought to be an untimely move.

NATIONALIZED MEXICAN AIRLINES

IT was announced last week that the Mexican Directorate of Aeronautics has decided to nationalize the country's civil air transport industry. In a speech given in his honour by the Aviation Club of Mexico, the Director of Civil Aviation stated: "It is no longer just or fair to Mexico that most of the earnings of the airlines and airports should go abroad now that the country ran'ts seventh in the list of the world's most important air transport industries." In point of fact, the Mexican Minister of Communications later denied the validity of the disclosure, but the Directorate



TRI-MOTOR TRANSPORT: Although the three-engine concept in airliner design has almost entirely disappeared elsewhere, among Italian manufacturers the firm of Fiat remain convinced of its practicability. The G.212, now being built in quantity in both passenger and freight versions, is being used by several Italian operators and also by the Egyptian company, S.A.I.D.E. The "212" can carry 26, 30 or 34 civil passengers and there is also a troop transport version with 36 seats. The payload of the freighter which is known as the "Aviocargo," is 9,900 lb.

CIVIL AVIATION . . .

of Aeronautics subsequently insisted that nationalization is the Government's intention.

There are now 35 airlines operating in Mexico, the largest of them being the Compania Mexicana de Aviacion, an affiliate of Pan American Airways. Another large company, LAMSA, is affiliated to United Airlines and U.S. interests also participate in several other lines. According to Mexican legislation, 51 per cent of the shares of any commercial company operating in Mexico must be owned by Mexican nationals, but it has, for some time, been apparent that the law was being circumvented in various ways and measures have been expected to tighten up on this provision.

DIFFERENCES OF OPINION

IT is *Flight's* policy to give expression to the personal ideas and opinions of qualified individuals because in order to obtain a good grasp of any subject it is necessary to study every point of view. Only by presenting all the angles (or as many of them as possible) can we provide the foundation upon which balanced judgment of any case may be built. Elsewhere in this issue, for example, we publish a second opinion on the ideal ultra-light aircraft inspired—to quote from the authors' covering letter—by "violent disagreement" with the suggestions put forward by "W. T. G." in the previous issue.

A feature of a rather different nature—namely, a personal commentary or, as it is often called in these days, "a column"—is one which invariably provokes criticism of one sort or another. Such contributions are nevertheless most valuable in airing and causing to be aired underlying considerations and prejudices as well as the plain facts, decisions and results. Psychologists would, we feel, support us as to the desirability of exposing skeletons, inhibitions, Achilles' heels, and so on, if the aim is to bring about the balanced view.

We may refer here to the most recent "Civil Aviation Commentary" (*Flight*, January 18th) with which certain readers, well qualified to criticize, have strongly disagreed. In it, Henry Morris remarked that it was difficult for the outsider to appreciate how scheduling could be divorced from operations and traffic in the latest B.E.A. set-up, and he went on to comment generally that the tendency to suit reorganization patterns to personalities, instead of making a clean break with an organization in which personalities were fitted to functions, had become an only-too-common practice. Reverting to the case of B.E.A., he thought it would have seemed logical for the specialized and important job of achieving the most efficient fleet utilization and scheduling to be placed under the operations director and handled, perhaps, by a slide-rule specialist of comparatively junior status.

In contrast to this personal opinion, there are those who feel most strongly that flight operations should not be mixed with scheduling and movements under an operations director, except, perhaps, in so far as they are co-ordinated by a top executive or his deputy. Traffic aspects are cited as another example: they, similarly, stand on their own feet and are quite separate again from scheduling and flight operations.

Regarding personal problems, a reader writes that he thinks that what Henry Morris says is "absolute nonsense," and he believes that if all the departmental heads in B.E.A. were run over by a bus tomorrow, thereby eliminating personal problems, men would immediately be sought to fill each of the existing jobs, on unchanged terms of reference.

We do not propose to take sides in this argument, but do not hesitate, even so, to add that it is our impression that the B.E.A. management is doing its level best to build up an efficient and profitable airline. It will not have escaped the notice of many of our readers that, in the comparatively short time it has existed, B.E.A. has developed a remarkably good team spirit, and this is undoubtedly one of the main ingredients of success.

NEW RADAR APPROACH AID

LAST Monday, February 4th, at Southend Airport, a convincing demonstration was given of the new simplified radar approach system developed by E.K. Cole, Ltd. In effect a one-man G.C.A. system, the equipment combines a 3 cm. radar installation with a V.H.F-D/F. receiver, the radar dish being mounted on a rotatable shaft in common with the D.F. aerial, so that the axis of the beam coincides with the null direction of the D.F. aerial. The radar dish is independently controllable in elevation, but is permanently coupled to the D.F. aerial in azimuth. A general description of the system will be included in a forthcoming issue.

BREVITIES

ON January 31st a Swissair DC-6 set up a new transatlantic speed "record" by flying from Gander to Shannon in 4 hr 36 min. This is said to be the fastest crossing of the Atlantic in either direction by a regular scheduled airliner.

* * *

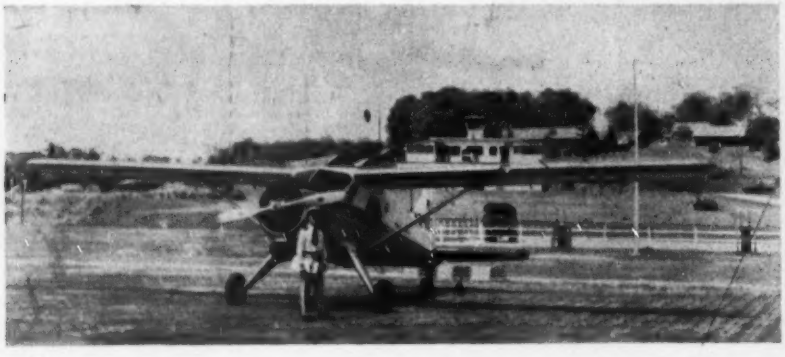
The Municipal Authorities of Rotterdam are planning to construct a new airport at an estimated cost of 4½ million guilders. About a quarter of this total has already been donated by local business concerns.

* * *

In 1952 the two main Parisian airports of Orly and Le Bourget registered some 74,551 aircraft movements. The number of passengers handled at these two terminals amounted to 1,217,553. The two totals represent increases of 42 and 37 per cent respectively over the results for the previous year.

* * *

So successful have been the initial services of the newly formed Japanese airline, J.A.L., that plans are now being made to establish two more domestic airline companies to compete with existing services. These two operators would be known as Tokyo Airlines and Far East Airlines and would have their main offices in Tokyo



CHIEF BEAVER: Capt. G. V. Renwick, chief pilot of a recently inaugurated company known as Beaver Service, is seen with one of the smart silver and red Canadian-built D.H. Beavers at Kuala Lumpur Airport. Carrying six passengers, these aircraft fly on internal route linking Kluang, Labis, Malacca and Batu Pahat with Kuala Lumpur and Singapore Island.

POUR LES CLUBS: Following the successful completion of an extensive trials programme the little Marcel Brochet 2/3-seat Avion de tourisme has been ordered in quantity by S.A.L.S., the government department responsible for fostering the healthy development of private flying in France. The total order is for 30 machines; ten of them will be of the two-seat variety, an example of which is shown here.

and Osaka respectively. All J.A.L.'s services are already achieving better than 80 per cent load-factors. Most of the passengers are local or foreign businessmen who are finding that, in addition to saving money, air schedules linking the key cities on the four main islands cut many hours from train and boat times.

* * *

It is probable that the European services now operated by South African Airways will soon be extended to Frankfurt. The potentialities of the route were surveyed recently by an S.A.A. official and his report—understood to be favourable—is now being studied by the South African Minister of Transport. If this new link comes into being S.A.A. would probably make use of B.E.A.'s ground facilities in Germany.

* * *

A combined deputation representing the Aerodrome Owners' Association and the Association of Municipal Corporations was received by the Minister of Civil Aviation at Ariel House on January 21st. Discussion took place on a statement submitted by the Association on future policy relating to non-State-controlled airfields. The Minister is understood to have expressed his appreciation of the constructive proposals put forward. A.O.A., incidentally, will celebrate its 18th anniversary on February 21st, when a new committee will also be elected.

* * *

At a cost of about £300,000 a large and fully-equipped repair shop is being erected at Mechanics Bay, Auckland, for the use of Tasman Empire Airways, Ltd. The shop will deal with all repair work on the company's Solent flying boat services. T.E.A.L., incidentally, have now begun a new 3,500-miles service between Auckland and Tahiti.

* * *

Field Aircraft Services, Ltd., are now completing work on a civil Catalina flying boat which arrived in this country recently on its way to Sweden. The aircraft, registered SE-AXD, was purchased in Pakistan from Kalinga Airlines by Helicopterflyg, of Stockholm. Since the war it has been used in the Far East and was at one time based at Hong Kong. Work has consisted of a double engine change, airscrew overhaul and certain airframe and radio repairs.

* * *

B.O.A.C. announced last week that it may shortly be able to resume calling at Farouk Airport on its Hermes flights to South Africa. The new Egyptian Prime Minister is said to be taking a personal interest in the re-establishment of international communications through Cairo. Incidentally, Air Cdre. Whitney Straight, B.O.A.C.'s chief executive, arrived in Cyprus last week during a tour of airfields which might be used instead of Cairo. As from February 6th, the Far East services were to use Nicosia

* * *

D.H. Dove aircraft which have been grounded in Australia since an accident on October 15th are to be allowed to fly again subject to certain safety precautions. The lower boom of the main spar must be replaced by a boom of new design approved by the Department of Civil Aviation by June 30th. Permission has been given for the old-type booms to be used in the meantime, however, provided that maximum flying time logged does not exceed 3,000 hr. The original failure occurred at 9,000 hr.

CLUB AND GLIDING NEWS

FOLLOWING the success of the Vintage Aeroplane Club's first rally, which was held at Denham during the week-end of January 19th-20th, a second rally has been planned to take place on May 3rd (not, as mentioned last week, on May 6th), at White Waltham. A considerably more ambitious programme has been tentatively drawn up for this next event, which will include various "set-pieces" by vintage types, pylon racing and competitions.

Although only twelve weeks have elapsed since the inauguration of this club, no time has been lost in its endeavours to recapture the atmosphere of the pre-war flying meetings, which is, of course, the club's principal *raison d'être*.

DURING the year 1951, the Southend Municipal Flying School flew a total of 1,851 hours. For the greater part of the year the fleet consisted of only three Autocrats and together these three aircraft completed the very creditable total of 1,705 hr. The remaining 146 hr were flown on the Dart Kitten, which logged 101 hr, and the Slingsby Motor Tutor, which accounted for the remaining 45 hr.

Private Pilots' Licences were gained by ten members; one Commercial Licence and two Instructors Ratings were also awarded. Five members are at present under training for their Commercial tickets and seventeen for P.P.L.s and the school has high hopes of a record year in 1952.

HAVING added another Auster Autocrat and a Magister to its fleet, the Denham Flying Club is preparing for another busy season. Mr. Terry Dawson, Denham's C.F.I., has left in order to join British European Airways and his place has now been taken by Mr. Derek Wright, who was previously C.F.I. with the Airways Aero Club, a subsidiary of Denham.

IT is understood that the Wolverhampton Aero Club is to open a flying school at Elstree in the near future. They will take over the present school which is now operating there. The existing flying club, however, will still continue to function under its present ownership.

STRATHTAY Aero Club logged a total of 101 hr 40 min flying in December when only 20 days were suitable for instructional and solo flying. Weather conditions were changeable, and at times difficult, and gusts of up to 100 m.p.h. were recorded on December 30th. For a number of days the club's Tiger Moths had to be grounded and kept behind closed hangar doors.

Three A.T.C. cadets qualified for P.P.L.s in December.

THE gliding club which flourished in pre-war days at Oxford under the direction of the famous glider pilot Richard Kronfeld has been revived and is now operating at Oxford Airport, Kidlington. It owes its existence to Professor G. C. Varley and Mr. Stafford Allen, who have fought for two years to get it going. It has 25 members and two gliders, one an Eon primary trainer and the other an Olympia. The club also makes use of an ex-R.A.F. balloon winch for training ground-slides. The annual subscription is £5 and the charge for each flight 2s 6d.

Richard Kronfeld was a refugee from his native Austria who joined the R.A.F., became a squadron-leader and, after winning the D.S.O. and D.F.C. gave his life for this country.

IN connection with the Appeal Fund which was recently launched by the British Gliding Association to help finance British participation in the World's Gliding Championships to be held in Spain this year, it has been announced that the S.B.A.C. has generously donated the sum of £1,000. Contributions have also been received from the following: S. G. Stevens, J. I. Cresswell, R. Clough, G. Bacon, J. Moore, D. H. G. Ince, Royal Naval Gliding and Soaring Association, P. A. Wills, Docker Brothers, British Ropes, Ltd., de Havilland Aircraft Co., Ltd., The Fairey Aviation Co., Ltd., R. B. Pullin and Co., Ltd., Cellon, Ltd., British Aviation Insurance Co., Ltd., Royal Aero Club, Sperry Gyroscope Co., Ltd., Sir Francis McClean.

In addition, Slingsby Sailplanes, Ltd., have agreed to lend five Sky sailplanes for the contests. Retrieving cars will be loaned by the Standard Motor Co., Ltd.: Pye, Ltd., have offered five ground/air communication sets; and R. B. Pullin and Co., Ltd., will lend the team five turn-and-slip indicators.

SERVICE AVIATION

Royal Air Force and Naval Aviation News

WITH HER SQUADRON: The Queen at No. 600 Squadron's town headquarters for the presentation of the new badge. She is talking to S/L J. P. Meadows, D.F.C. On the left are A.V-M. Lees and the Lord Mayor of London, while behind the Queen is A.V-M. Yool.

The Queen with No. 600 Squadron

ON Thursday evening of last week the Queen paid her promised visit to Finsbury Barracks to present a new badge to No. 600 (City of London) Squadron, R.Aux.A.F., of which unit she is Honorary Air Commodore.

On arrival Her Majesty was met by the Regular Adjutant, F/L. Jagger, and escorted to the dais in the drill hall, where No. 600 was on parade in review order under the command of S/L. J. P. Meadows, D.F.C.

Addressing the squadron before the presentation, the Queen said: "The men who formed No. 600 City of London Squadron set a high standard, which their successors have always maintained. At the same time they laid the foundations of a very great tradition. Not only do you have the tradition of the Royal Air Force behind you, but as the City of London Squadron you are fortunate—and, I know, proud—to carry some part of the traditions of your great city." Referring to the squadron's descent from the historic Train Bands, the Queen concluded by saying: "You have joined a proud company of free men who, down the ages, have taken up arms in defence of justice and right." The Queen then presented the new badge.

In his reply S/L. Meadows thanked Her Majesty for the trouble she had taken to enable No. 600 to incorporate the City of London crest in the badge. "We fought under it," he said, "and it is symbolic of our squadron." His final remark was: "We now have two loyalties—to the R.A.F. and the City of London. We cannot say which we value most."

NEW BADGES FOR OLD: The original badge of No. 600 Squadron, now officially granted by the King.

After the ceremony the Queen visited the airmen's canteen and the sergeants' mess, and received a number of officers and guests in the ante-room. She met several of the older members of the unit, including Capt. A. G. Lamplugh and F/L. J. Courtis, both of whom were pilots with No. 600 when it was first formed in 1925.

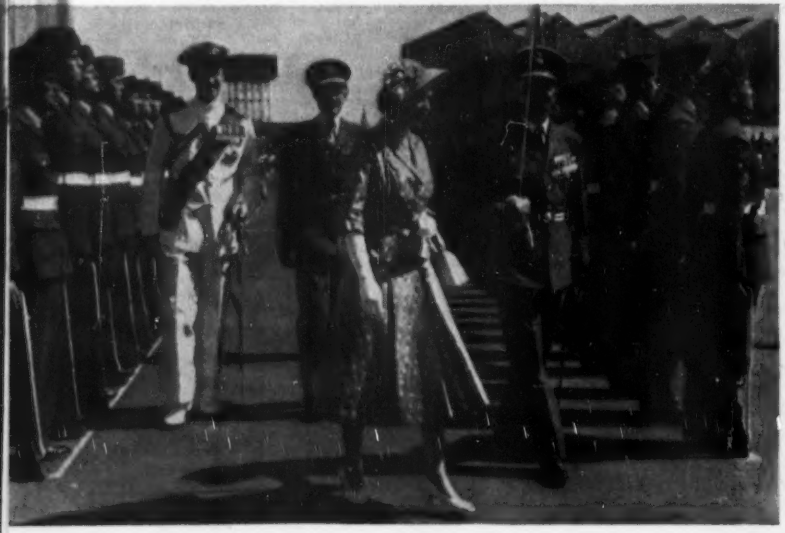
The presentation of the new badge—which in reality is the original—brings to an end a struggle which has continued since the R.Aux.A.F. was re-formed in 1946. During the war, when so many badges were issued to squadrons, the Chester Herald designed one for No. 600, which was then on night-fighter duties. The sword and crescent moon then incorporated appeared to be appropriate enough; but on returning to London, and becoming once more an Auxiliary unit, the squadron felt that the City's crest would be more suitable. The Queen's advocacy has enabled them to achieve this aim, but the standard official badge has not been withdrawn, so No. 600 has the distinction of being the only unit to have two official badges.

Class "G" Call-up

THE first warning notices for the call-up of 4,700 R.A.F. class "G" reservists of the Control and Reporting organization were despatched last week. Reservists being called this year are mainly radar operators and radar and wireless fitters. The officers involved in the call-up, which will total 5,500, will be notified shortly.

In addition to those being called up, the service is prepared to accept volunteers who are released officers or class "G" reservists, and who have the necessary specialist qualifications.

Last year nearly 9,000 officers and men of the Control and Reporting organization were recalled for 15 days' service.



NINETEEN HOURS OUTWARD: Princess Elizabeth and the Duke of Edinburgh inspecting the R.A.F. guard of honour at Nairobi Airport. They are attended by A. Cdre. L. T. Pankhurst, and F/L. A. Roberts is the officer of the guard.

VICE-ADMIRAL C. E. LAMBE, who is a qualified pilot, leaving his aircraft for a tour of inspection at Lee-on-Solent. Admiral Lambe is to be Flag Officer, Royal Yacht, for the Australasian tour of Princess Elizabeth and the Duke of Edinburgh.

Deputy Atlantic Commander

THE Admiralty announces that Vice-Admiral Sir William G. Andrewes is being appointed to the post of Deputy SACLANT (Supreme Allied Commander Atlantic).

Sir William has held two carrier appointments. Shortly before the outbreak of war in 1939 he commanded H.M.S. *Albatross*, the seaplane carrier, and for a while after the war was Commanding Officer of the *Indomitable*.

First Lord at Syerston

THE First Lord of the Admiralty, the Rt. Hon. J. P. L. Thomas, visited R.A.F. Station, Syerston, Notts., on Friday last to present wings to 20 naval and nine R.A.F. pilots. He was accompanied by Vice-Admiral E. W. Anstice, the Fifth Sea Lord, and Rear-Admiral W. T. Couchman, Flag Officer, Flying Training. Attending the ceremony from the R.A.F. were Air Marshal Sir Hugh S. P. Walmsley, A.O.C.-in-C. Flying Training Command, and A. V-M. A. Hesketh, A.O.C. No. 23 Group.

The senior naval pilot to have his wings pinned to his left sleeve was Lt. Cdr. B. C. G. Place, D.S.C., D.S.C., R.N. He gained his Victoria Cross for service in a midget submarine against the German battleship *Tirpitz* in 1943.

Army Co-operation

TO help the army in its fight against terrorists in the Canal Zone villages, the R.A.F. have been using a Vickers-Armstrongs Valetta equipped with a loud hailer. It has been flown over the Tel-el-Kebir region, broadcasting to villagers, telling them that British forces were entering the area to operate against terrorists allowed to take refuge in the villages.

R.A.F. Foundationers

FOUR R.A.F. Foundationers have entered Christ's Hospital under the terms of the trust by which the R.A.F. Benevolent Fund and Mr. B. N. Wallis have each provided £10,000 for the education of children of R.A.F. personnel. This is the initial entry.

The next entry will take place in September and applications should be lodged not later than March 31st.

A.F.M. for Para-Rescue

ANOTHER member of a Canadian para-rescue team, Sgt. G. B. Leckie, has been decorated for his part in a rescue operation in Washington State. The citation covering the award of the Air Force Medal reads:—

"Sgt. Leckie was the jump-master of a Royal Canadian Air Force para-rescue team detailed to carry out the rescue of two civilian occupants of a Canadian aircraft which crashed on Mount Hozomeen in the American Rockies, State of Washington, U.S.A. On his arrival over the scene of the crash, Sgt. Leckie assessed the situation, noting that the terrain was particularly rugged, being heavily wooded, interlaced with deep gorges and studded with jagged rocks. Fully aware of the dangers involved in operations of this nature, he decided that the circumstances warranted the risk involved and that the para-rescue team should attempt a landing by parachute. The team made a successful descent and under the leadership of Sgt. Leckie, efficiently performed their arduous task of effecting the rescue from the heavily wooded mountainous terrain. Sgt. Leckie's display of leadership and gallantry were in keeping with the highest traditions of the R.C.A.F. and have resulted in a high state of morale and confidence amongst his subordinates."

Far East Ferry Flights

THE first stage of the longest jet ferry-flights yet made by R.A.F. pilots ended on January 29th, when six Vampires arrived in Britain from Singapore. The pilots flying them had previously flown out to the Far East six replacement Vampires fitted with cockpit-refrigeration units.

The two-way trip is nearly 18,000 miles long and further replacement flights will be made regularly between Britain and Singapore until April. The Vampires are being used against the bandits in Malaya.

Carrier Programme

DETACHED temporarily from the Home Fleet to the Mediterranean Fleet, H.M.S. *Theseus* is to prepare to take over from H.M.S. *Ocean*, as the latter may be required to relieve H.M.S. *Glory* in the Far East at the end of April.

If the *Ocean* relieves the *Glory*, the latter will return to the Mediterranean by the end of May. The *Theseus* will then return to home waters.

Air Cadets' Exchange Visits

TO commemorate the Air Cadets' Exchange Visits of 1951 a souvenir booklet has been prepared by Home Command. Profusely illustrated, it deals with the high spots of each tour—the Canadians being entertained by the King and Queen at Balmoral; the Americans at South Bank and Battersea Park; the demonstrations at White Waltham; and the A.T.C. at the Capitol. These contents make the reader realize just how fortunate any lad is who is selected to join such a party.

EASTBOURNE GETS AIRBORNE: Of the 60 English and Scottish Public Schools to take up gliding as part of the training of the R.A.F. section of their cadet forces, Eastbourne College is one of the first to start. Some of the cadets are seen here flying their Eon Eton.

"Flight" photographs

AT NORTH LUFFENHAM: On Friday last, the Secretary of State for Air inspected the Canadian Sabre-equipped No. 410 Squadron, R.C.A.F. Above, Lord De L'Isle and Dudley is seen with G/C. Hale, O.C. North Luffenham, and A.V-M. R. L. R. Atcherley, A.O.C. No. 12 Group. On the right, No. 410's Sabres are shown lined up on the ground and flying past in the low winter sunshine.

SERVICE AVIATION . . .

Naval Aviation Appointment

THE Admiralty announces the appointment of Capt. E. V. St. John Morgan, D.S.C., to command R.N. Air Station, Yeovilton.

Boyd Trophy

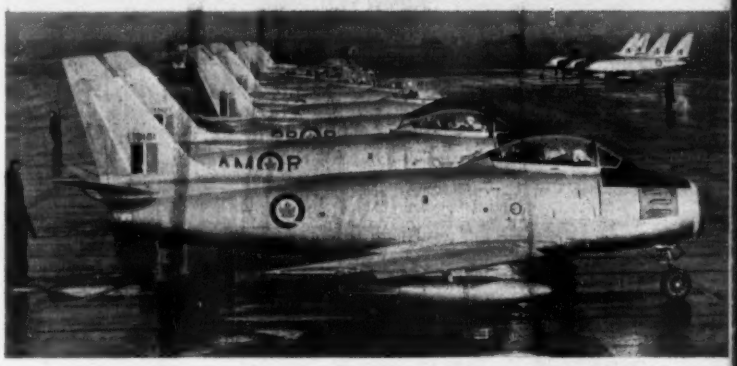
AWARDED annually for the most meritorious feat of naval aviation, the Boyd Trophy for 1951 has been won by No. 814 Squadron (commanded by Lt. Cdr. A. C. Lindsay, D.S.C., R.N.) "for its outstanding contribution to night-flying during the past 18 months." Announcing the award Vice-Admiral C. E. Lambe, Flag Officer Air (Home), said that the squadron had done more than any other unit to overcome the difficulties of operating naval anti-submarine aircraft at night.

At Culdrose during the winter of 1950-51, and later while embarked in H.M.S. *Vengeance*, No. 814 persevered with its training and the development of night deck-landing methods and weapon tactics. The squadron is now based at R.N.A.S. Eglinton and some of its pilots are temporarily attached to R.A.F. Boscombe Down, whence night deck-landing trials of the Fairey Firefly 7 will shortly be carried out in conjunction with the trials carrier, H.M.S. *Illustrious*.

S. of S. With the Canadians

LORD DE L'ISLE AND DUDLEY last week visited the Canadian Fighter Wing based at North Luffenham in Rutland. He arrived in a Valetta, which had to make a G.C.A. landing because a snowstorm had reduced visibility to a matter of yards. He was received with a Guard of Honour by G/C. Hale, who commands the Wing, and A. V-M. R. L. R. Atcherley, A.O.C. No. 12 Group. During the visit he toured the whole station and chatted with the C.O. (S/L. L. Hall) and pilots of No. 410 (Cougar) Squadron. He was particularly interested in their g-suits.

In a brief speech he told the Canadians that they were "joining the most highly organized system of fighter interception which exists in the world." He praised the F-86s with which the squadron is equipped and referred to the manner in which Britain is pressing on towards the re-equipment of its squadrons with modern aircraft.



R.A.F. Officer Pilots' Tie Club

SINCE its inception in 1937 more than 3,600 officers have joined the Royal Air Force Officer Pilots' Tie Club. Membership is restricted to past and present officer pilots of the R.A.F., the R.A.A.F. and Dominions Air Forces who have flown at least 500 hours as a pilot or have been on operations as a pilot.

The tie is dark blue with red stripes and light blue eagles. One shilling of the price of every tie purchased goes to the Royal Air Force Benevolent Fund, which so far has benefited by £302.

Life membership of the club is obtained on payment of one shilling. The honorary treasurer and secretary is G/C. G. A. R. Muschamp. Membership cards and ties are obtainable from Gieves, Ltd., 27 Old Bond Street, London, W.1.

Radio School Passing-out Parade

THE reviewing officer at the passing-out parade of the 61st Entry at No. 6 Radio School, Cranwell, was Air Marshal Sir John Whitworth-Jones, K.C.B., C.B.E., who has been A.O.C.-in-C. Technical Training Command for the past three years.

Addressing the assembled company at the prize-giving Sir John said: "We know that there is no body of young men in this country embarking on a more worth-while adventure." He especially complimented Cpl. Air App. Eric Mansfield, the outstanding apprentice of the course. Mansfield took five of the eight available prizes and was awarded a technical cadetship.

Prizewinners of the Entry were: Cpl. Air App. E. A. Mansfield—(Hyde Thompson Memorial Prize, Apprentices' Endowment Trustee Prize, Ground Radar Fitters' Prize, Highest Educational Marks and Highest Aggregate Marks); Sgt. Air App. E. F. Munday—(Air Radio Fitters' Prize); and Sgt. Air App. T. Hilliard—(General Service Subjects Prize). Air App. P. Hadlington won the Victor Ludorum Trophy and the Wing Championship Cup went to "A" Squadron.

Since the school opened at Flowerdown in 1925 some 4,500 men have successfully completed their signals training.

Reunions

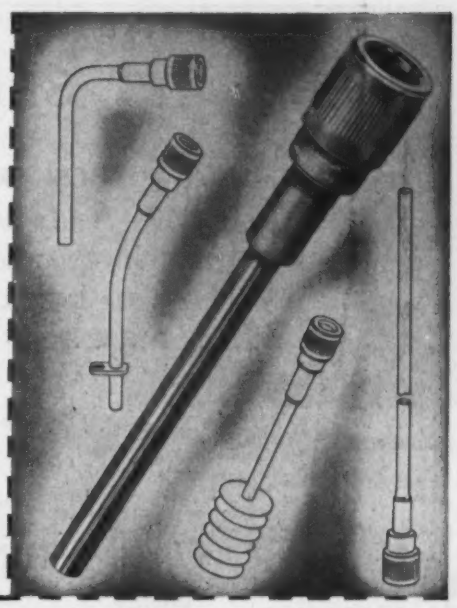
THE annual dinner of the R.A.F. Dinner Club will take place at the Park Lane Hotel on March 21st. Marshal of the Royal Air Force Sir John Slessor will be the guest of honour.

Officers of H.Q. No. 44 Group, Gloucester, and Stations, propose to hold their fourth reunion dinner on Friday, March 14th. It will be a "stag" party and Mr. T. Morris, 17, Hyde Park Street, London, W.2, will supply details.

The 35th anniversary reunion of No. 84 Squadron will be held in London on Saturday, March 1st. Tickets, 6s 6d each, may be obtained from Mr. O. Greenwood, 4, Kensington Court, London, W.8.

Weston Resistance Bulbs

The Model S.110 Platinum Resistance Bulb, used in conjunction with a Weston circular scale indicator is greatly superior in every respect to other methods of temperature measurement. Its platinum element is the most stable, accurate and the smallest yet produced for practical applications. Due to the very small size of the resistance element, the response time is extremely rapid. Reliability and long life are ensured by the fact that the element is hermetically sealed into a ¼" o/dia. stainless steel sheath which is fitted with a watertight plug connection. The socket is moulded integrally with special cable which is supplied. The Model S.110 is suitable for temperatures between −200°C. and +500°C. Full details of Weston equipment for aircraft will gladly be supplied on request.



WESTON
AIRCRAFT INSTRUMENTS

SANGAMO WESTON LIMITED
ENFIELD **MIDDLESEX**
Tel: Enfield 3434 (6 lines) 1242 (4 lines) *Grams: Sanwest, Enfield*
Scottish Factory: Port Glasgow, Renfrewshire
Branches. Glasgow, Manchester, Newcastle-on-Tyne, Leeds, Liverpool, Wolverhampton, Nottingham, Bristol, Southampton, Brighton

DIAL AMBASSADOR 2091

We again take the opportunity of reminding you that our SALES DEPARTMENT is now established at our new Head Office and is at your service, as usual.

Aviation Traders Limited

15 St. Cumberland Place, London W.1

Telephone: **AMBASSADOR 2091** (5 lines) • *Telegrams:* **"AVIATRADE, WESDO" LONDON** • *Cables:* **"AVIATRADE" LONDON**

AIRCRAFT SPARES

for

DC3/C47 DAKOTA • C54 SKYMASTER

L5 STINSON • AT6 HARVARD

AIRFRAME, ENGINES, PROPELLER,
ACCESSORIES AND INSTRUMENTS.
READY STOCKS FOR EXPORT OVERSEAS

Largest Quantities Available in the World

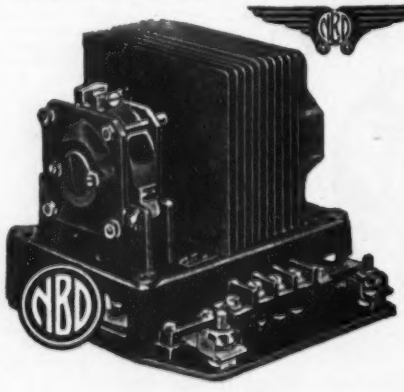
•

HINDUSTAN AIRCRAFT LTD.

BANGALORE • INDIA

TELEGRAMS: "AIRCRAFT"

NEWTON-DERBY



AUTOMATIC

VOLTAGE REGULATORS

Also Makers of Rotary Transformers and Anode Converters. Wind and Engine Driven Aircraft Generators. High Frequency Alternators and High Tension D.C. Generators

ELECTRICAL PLANT SPECIALISTS

NEWTON BROTHERS (DERBY) LIMITED

THE COLLEGE OF AERONAUTICAL AND AUTOMOBILE ENGINEERING

President: Lord Brabazon of Tara, P.C., M.C., F.R.Ae.S.

Chelsea and Redhill Aerodrome

Diploma Courses combine full day workshop and technical training and commercial experience for executive appointments in Aviation.

Coaching for R.Ae.S. Associate-Fellowship examination, Parts 1 and 2 : I.Mech.E., Sections A and B : Aircraft Engineers' Licences : and Common Preliminary Examination of the Engineering Joint Examination Board.

Fully equipped aeronautical engineering shops with accommodation for nearly 500 students. Test House approved by A.I.D. and A.R.B.

Syllabus from the Principal

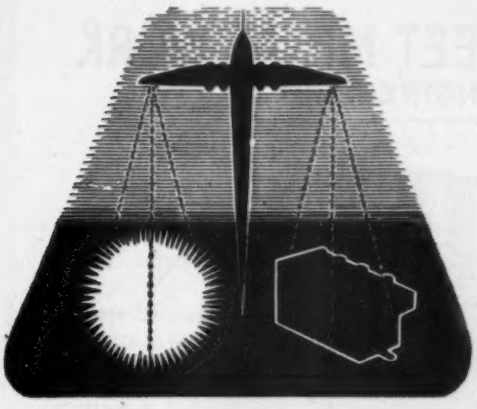
SYDNEY STREET, CHELSEA, LONDON, S.W.3

Flaxman 0021

Also Training for

AIRCREW TECHNICAL EXAMINATIONS

(Issues and Endorsements)



LIGHT/WEIGHT EFFICIENCY

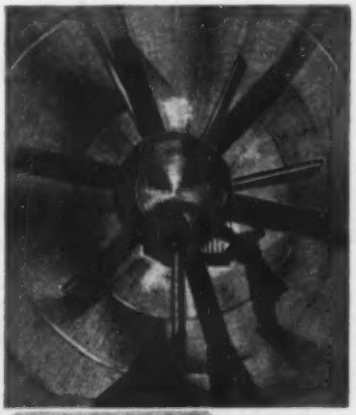
The power-weight ratio of an aircraft battery is a factor that needs particularly careful consideration. All batteries are heavy, but by no means all are capable of giving maximum efficiency over long working periods

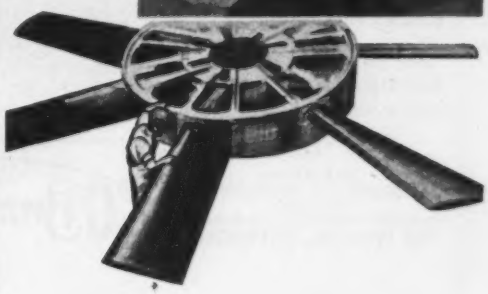
Oldham Aircraft Batteries have been designed with this problem fully in mind. By insisting on only the finest materials and by subjecting them to the very latest manufacturing processes, Oldham craftsmen have produced an aircraft battery that gives a consistently high output for the minimum amount of weight.

OLDHAM

Power to Spare
AIRCRAFT BATTERIES

OLDHAM & SON LTD · DENTON · MANCHESTER · EST. 1865





The heart of an efficient wind-tunnel
-AIRSCREW FANS

THE design and construction of wind-tunnel fans is a task calling for thorough knowledge both of the aerodynamic principles involved and of the practical problems to be overcome. It is, in fact, a task for the *specialist*. That AIRSCREW Wind-tunnel Fans are to be found in research establishments and aircraft firms throughout the country — and elsewhere in the world — is a clear indication of the degree and the efficiency of AIRSCREW's specialisation in this service to aviation.

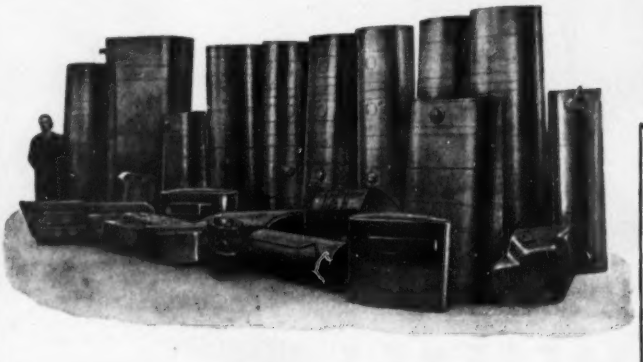
The lower illustration shows a seven blade, 24′ diameter fan built by Airscrew for Vickers-Armstrongs Ltd. Enquiries for wind tunnel fans of all types for test, research and instructional work are welcomed by—

THE AIRSCREW COMPANY
& Jicwood Limited

WEYBRIDGE, SURREY Telephone: Weybridge 1600

EVERYTHING IN SHEET METAL WORK

AND LIGHT ENGINEERING



AIRCRAFT
AUTOMOBILE
COACH AND BUS BODIES
Municipal and other ALL-METAL Vehicle Bodies

Refrigeration
COLD STORAGE
HEATING
DRYING
AIR Conditioning
MINING

TELEGRAMS: BROMELPAR, SOUTHTOT, LONDON
161 West Rd., TOTTENHAM

E. G. Brown & Co. Ltd

TELEPHONES: TOTTENHAM 2357, 2258 & 2255
LONDON, N.17

VICKERS-ARMSTRONGS
LIMITED

have vacancies for

TOOL DRAUGHTSMEN

PRODUCTION DEVELOPMENT ENGINEERS

METHODS ENGINEERS

AIRFRAME PLANNING ENGINEERS

MACHINE SHOP PLANNING ENGINEERS

Apply, giving full particulars, to

PERSONNEL DEPARTMENT
SOUTH MARSTON, NEAR SWINDON, WILTS.

SLINGSBY SAILPLANES LTD.
CONTRACTORS TO H.M. GOVERNMENT

DESIGNERS AND MANUFACTURERS OF

THE FAMOUS "SKY" SAILPLANE

The leading competition machine with performance and handling characteristics superior to any other sailplane in production.

AN ALL-BRITISH PRODUCT

SLINGSBY KIRBYMOORSIDE YORKS

"PIONEERS OF BRITISH GLIDING"

Jubilee

THE FINEST CLIP in the world

L. ROBINSON & CO., (GILLINGHAM) LTD.,
London Chambers GILLINGHAM KENT PHONE 3261

Proud to be

SERVING FAMOUS FIRMS . . . .

Heston Aircraft have long specialized in the complete design and manufacture of a variety of aeronautical equipment—from simple components to complete aircraft. Leading manufacturers who rely on the service of Heston Aircraft include :—

- The de Havilland Aircraft Co. Ltd.
- Vickers-Armstrongs Ltd.
- D. Napier & Son Ltd.
- B.O.A.C.

HESTON AIRCRAFT COMPANY, LIMITED

Heston Airport, Hounslow, Middlesex

REYNOLDS

From the earliest days of Aeronautical development, Reynolds have pioneered in new products and improved production methods. Today, the confidence of the Aircraft Designer in specifying Reynolds products, including manipulations and welded assemblies, is a tribute to the skill and experience of their Works Personnel using up-to-date plant and techniques.

REYNOLDS TUBE CO. LTD - TYSELEY - BIRMINGHAM, 11

FLIGHT and AIRCRAFT ENGINEER

PRESS DAY—*Classified advertisement "copy" should reach Head Office by* FIRST POST THURSDAY *for publication in the following week's issue subject to space being available.*

CLASSIFIED ADVERTISEMENTS

Advertisement Rates. 4/- per line, minimum 8/-, average line contains 6-7 words. Special rates for Auctions Contracts, Patents, Legal and Official Notices, Public Announcements, Tenders 5/- per line, minimum 10/-. Each paragraph is charged separately, name and address must be counted. All advertisements must be strictly prepaid and should be addressed to FLIGHT Classified Advertisement Dept., Dorset House, Stamford Street, London, S.E.1.

Postal Orders and cheques sent in payment for advertisements should be made payable to Iliffe & Sons, Ltd., and crossed & Co.

Trade Advertisers who use these columns regularly are allowed a discount of 5% for 13, 10% for 26 and 15% for 52 consecutive insertion orders. Full particulars will be sent on application.

Box Numbers. For the convenience of private advertisers Box Number facilities are available at an additional charge for 2 words plus 1/- extra to defray the cost of registration and postage, which must be added to the advertisement charge. Replies should be addressed to "Box 0000, c/o Flight," Dorset House, Stamford Street, London, S.E.1.

The Publishers retain the right to refuse or withdraw advertisements at their discretion and do not accept liability for delay in publication or for clerical or printer's errors although every care is taken to avoid mistakes.

AIRWORK LIMITED

have been granted exclusive rights of sale for the fleet of four Doves being disposed of by Central African Airways.

With the sale of each Dove must go a percentage of spares consisting of engines, spare propellers, power plants, together with a large holding of engine and aircraft spares.

Particulars and prices from

AIRWORK LTD.,
15 Chesterfield Street,
London, W.1.

Telephone : GROS. 4841.

AIRCRAFT FOR SALE

FIELD AIRCRAFT SERVICES, LTD.
offer
"COMPREHENSIVE AIRCRAFT SERVICE"

AIRCRAFT

New Proctor V airframes installed with completely overhauled engines and many other types available.

AIRCRAFT SERVICE

Complete overhauls—maintenance—modifications—installation high density seating—engine changes—aircraft handling.

ENGINES

We can supply the following types of engines completely overhauled and released to A.R.B. requirements and covered by standard guarantee.
P. and W. 1830-92, 90C, 90D, 985s.
Cheetah IX, X, XV.
Gipsy Queen II, III.

ENGINE SERVICE

Complete overhauls of the following types:
Cheetah series. Gipsy series.
Pratt and Whitney. Cyclones.
Cirrus.
We operate engine exchange schemes to most parts of the world.

PROPELLERS

Dakota and Proctor overhauled available from stock, also overhauls and repairs.

INSTRUMENTS and ACCESSORIES

Repairs—overhauls—all types of instruments and accessories.

SPARES

A wide range of aircraft and engine spares in stock and a competent staff to assist in the location of spares in short supply.
Let us know your requirements.

FIELD AIRCRAFT SERVICES, LTD.
CROYDON AIRPORT,
SURREY.
Tel.: Croydon 7777.
Cables: Fieldair, Croydon. [0250

DARLINGTON AND DISTRICT AERO CLUB
OFFER FOR IMMEDIATE DELIVERY

PROCTORS FROM £150.

Proctor III.	Engine hours 245.		Airframe hours		1,962.
Proctor III.	"	"	224.	"	1,190.
Proctor III.	"	"	275.	"	519.
Proctor I.			880.	"	3,110.

MILES MAGISTERS FROM £200.

Magister.	Engine hours 860.		Airframe hours		2,000.
Magister.	"	"	183.	"	1,468.
Magister.	"	"	460.	"	1,400.
Magister.	"	"	218.	"	1,550.
Magister.	"	"	150.	"	960.

AUSTER AUTOCRATS FROM £450.

Auster.	Engine hours 960.		Airframe hours		970.
Auster.	"	"	850.	"	940.

WE ARE PREPARED TO ACCEPT A MILES GEMINI IN PART EXCHANGE AGAINST ANY OF THE ABOVE AIRCRAFT.

DARLINGTON AND DISTRICT AERO CLUB
41 BLACKWELLGATE, DARLINGTON.
Tel.: Darlington 5397. [7640

PERCIVAL PROCTOR V, Auster Autocrat, Tiger Moth, Globe Swift, Cirrus Minor II engine with starter, Cirrus Minor I propeller, Auster Lycoming propeller, Auster spares, Tiger Moth spares.
WHEATLEY, Mill Lane, York. Tel. 2529. [7640

MILES MESSENGER, N.38 full 4-seater, airframe 380 hrs., engine Gipsy Major 1D, 170 hrs. C. of A. until December 1952, colour duo-blue; £1,000 or exchange for light single or twin or post-war motor-car, cash either way.—Tel.: Palmers Green 7909. [0930

All Black Leather fully lambswool lined

FLYING BOOTS

as illustrated. Gent's, £5/19/6. Ladies, £5/13/6. All-leather fully White Wool lined, zip-front calf-length BOOTS, Brown only, 94/6. Brand new, zip front, Brown Suede FLYING BOOTS, 94/6. White Silk INNER GLOVES, 6/6. Reversed Chamois INNER GLOVES, 12/6. Ex-Naval Woollen UNDER GAUNTLETS, 5/3. Three-quarter-length Kapok-lined waterproof FLYING JACKETS, 57/6. Mark VIII GOGGLES, fitted clear lenses only, 19/6. Complete with spare tinted lenses, 22/6. Spare clear lenses, 7/6. Leather Fleece-lined LUMBER JACKETS, £8/15/-.
TERMS TO FLYING CLUBS. TRADE SUPPLIED.
SEND 3d. IN STAMPS FOR ILLUSTRATED CATALOGUE.

D. LEWIS LTD. (Dept. F)
Leather Clothing Manufacturers for Home or Export
124 GT. PORTLAND ST., LONDON, W.1
Trade Inquiries Invited.
Tel.: Museum 4314. Grams: Aviabit, Wesdo, London

Hunting Air Travel Ltd.
Require qualified
PILOTS & RADIO OFFICERS
for their Viking Fleet
Standard Salaries Payable
Please forward full details to:
OPERATIONS MANAGER
Bovingdon Airport,
Hertfordshire
Bovingdon 2296 *Extension 14*

COTTON BAGS
FOR SPARE PARTS, Etc.
WALTER H. FELTHAM & SON, LTD.
Imperial Works, Tower Bridge Road,
Telephone: HOP 1784 **London, S.E.1**

Palmer FOR SAFE LANDINGS
TYRES • WHEELS • BRAKES *Etc.*

AIRCRAFT FOR SALE

AEROSERVICES (LONDON), LTD.

Take pleasure to announce their arrangements for ferrying to the United States of America nine Douglas Dakota and Lockheed Lodestar aircraft sold to their American associates. One of these aircraft has already arrived in the U.S.A. and another is due to leave the United Kingdom this week, with the others quickly following.
Owners wishing to sell large aircraft should waste no time in sending to us details of any large types which they have for disposal.
Dollars await sellers of good aircraft.

AEROSERVICES (LONDON), LTD.,
48, HERTFORD STREET,
PARK LANE,
LONDON, W.1.
Tel.: GROsvenor 7272.
Cables: Aeropaul, London. [3040

R.
K.
DUNDAS, Ltd.

WE continue to pack and ship light aircraft all over the world to the evident satisfaction of our many friends and clients. If you are thinking of taking the plunge while circumstances are so much on the buyers' side, please get into touch with us asking for our list of aircraft available.

R.
K.
DUNDAS, Ltd., 29, Bury Street, London, S.W.1.
WHI. 2048. Cables: Dundasaero, Piccy, London.,

CROYDON AIRPORT: Ops. 0499.

VENDAIR, Croydon Airport, offer the following:—

SEABEE, choice of several.

RAPIDE, with or without C. of A.

PROCTOR, dual control, with new C. of A.

TIGER MOTH, Magister and Consola.

VENDAIR, Croydon Airport, CROydon 2777. [0003

TIGER MOTH with 12 months' C. of A. Engine only 60 hours. Colour: Blue and silver. Price £325.

AUSTER AUTOCRAT with 12 months' C. of A. Engine 4 hours, 060. Colour: Blue and silver, with new red upholstery. Price £675.

COWES AERO CLUB, Cowes Airport, Cowes, I.O.W. [7026

W. S. SHACKLETON, Ltd., 175, Piccadilly, London, W.1, Europe's biggest aeroplane dealers, offer below eight aeroplanes from our own extensive stocks of aircraft. These are our own property and are offered subject to their remaining unsold. Immediate delivery can be given. A ninth aeroplane, a lovely little Moth Minor, was sold by us to its present owner two or three years ago and is being taken back as soon as we can arrange to fetch it from Northern Ireland. We would deliver it to your nearest aerodrome for £20 inclusive. It has not flown since its Certificate of Airworthiness was renewed recently.

£WXYZ D.H. 89 RAPIDE. Latest Mark 3 model and one of the last to be built. Fitted 8 passenger seats or 7 seats and toilet. The Gipsy Queen III engines have run 50 and 75 hours only since complete overhaul by De Havillands and are cleared for a life of 1,000 hours. Large cabin door, 3/3 propellers, fabric excellent, cabin heaters. Current C. of A. Undoubtedly one of the best Rapides in the world. Best offer accepted, but we are not giving this particular aeroplane away!

£245 D.H. MOTH MINOR (see note above). Under 200 hours since new on airframe and Gipsy Minor engine. Dual controls, long-range tanks and fitted with many extras. Painted silver with blue flash and lettering. What a bargain!

£??? AUTOCRAT—offers wanted. Under 200 hours since new. Fitted starter, battery, metal propeller, sunblinds, P.12 compass, directional gyro, etc. New sandcast cylinder heads. Any demonstration.

£450 AUSTER V, with an almost new Cirrus Minor II engine, fitted by the engine makers who renewed the C. of A. recently. Full blind flying panel. An absolute bargain. Three new seats fitted.

£675 AUTOCRAT. New Certificate Airworthiness and completely overhauled and modified engine. Fitted starter, long-range tank and metal propeller. Exchanges considered.

£??? TIGER MOTH. Offers wanted. Very low airframe hours and Gipsy Major engine with only 130 hours since new. C. of A. August 1952.

£1095 MILES MESSENGER. Cirrus Major III engine. A really good aeroplane with long-term C. of A., full panel, starter, etc.

LIST price. AUSTER AIGLET. Brand new and only just delivered to us by the makers. Bench type rear seat enabling it to be used as an occasional 4-seater. Painted silver and red with red upholstery. Fitted silencer.

£650 PROCTOR V with long-term Certificate Airworthiness and under 200 hours since new. This plane has long-range tanks and dual controls, and is in immaculate condition.

ALL the above aeroplanes are offered from our own stocks except the Moth Minor which we have arranged to purchase.

W. S. SHACKLETON, Ltd., 175, Piccadilly, London, W.1. Tel.: Regent 2448/9. Overseas Cables: "Shackaud, London." [0070

AIRCRAFT WANTED

WANTED, Auster three- or four-seat model, short C. of A. acceptable. Pay fair cash price. Private buyer.—Box 6726. [7065

FOUR-SEATER, dual-control aircraft with or without C. of A. Urgent. Especially interested in Beechcraft or similar.—Heron, Keystone Garage, Exeter Road, Bournemouth. [7067

W. S. SHACKLETON, Ltd., Europe's biggest aeroplane dealers, are always looking for good aircraft to supply to clients all over the world, and would welcome offers of any type of aircraft, either for direct purchase, part-exchange, or sale on consignment.

W. S. SHACKLETON, Ltd., 175 Piccadilly, London W.1. Tel.: Regent 2448-9. [0071

AIRCRAFT ACCESSORIES AND ENGINES

PESCO feathering pumps o/w motors, 24 volts, for DCIs and DCIIs, guaranteed brand new. A.R.B. released.—E. and W.S. Co., 60, Church Road, Mossley, Birmingham. [7019

"Aeroplane" Photo

. . . . . and then there were 7

Following last week's announcement of our stock of DE HAVILLAND D.H. 89 DRAGON RAPIDE AIRCRAFT, we can now state that two of this particular batch have already been sold. The seasonal spring rise in sales seems to be a little early this year, and these two sales are very likely, judging by the number of enquiries, to be followed by others.

Whilst we are not worried regarding possible sales of this particular stock, we are concerned somewhat about our capacity for the overhaul of those requiring a full 12 months' C. of A. for, besides Rapides, we do stock, sell and overhaul all other types of machines, including Consuls, Austers, Proctors, Geminis, etc., etc., and an assortment of such aircraft is currently passing through our overhaul shop. So, if your requirement is for a delivery in the Spring of a Rapide fully overhauled in our own hangar with a full C. of A., we do sincerely urge very prompt enquiries in order that the aircraft may be in the air on schedule.

Normally seating eight. Cruising speed 123 m.p.h. (198 km.h.). Consumption 20 Imp. gallons (90 litres) of fuel per hour. Prices range between £1,300 and £1,750.

We have, of course, a few Rapides all ready for the air. Literally immediate delivery and our very closest attention and consideration is given to all enquiries.

Specifications of all aircraft in stock will be gladly sent on request, together with our illustrated brochure **"The Aerocontacta-logue."**

FLASH!
GROUND GENERATORS
driven by J.A.P. engine,
charging 1260-watt 35-volts
56-amp 1800 r.p.m.

AEROCONTACTS
Limited
GATWICK AIRPORT, HORLEY, SURREY
TELEPHONE HORLEY 1918 CABLES AEROCON HORLEY

AIRCRAFT ACCESSORIES AND ENGINES

ALLISON aircraft engines, Series V-1710, new in original packing cases.—Box 6231. [7030

AERO SALES, Inc., procurement specialists for all American aircraft, engines, accessories. Quotations furnished on all requests.—Address: P.O. Box 37, Miami International Airport Branch, Miami 48, Florida, U.S.A. London Agents: C. J. Fox and Sons, Ltd., 117 Victoria Street, London, S.W.1. Tel.: Victoria 0204/5. [3045

AIRCRAFT ACCESSORIES AND ENGINES WANTED

URGENT. Wanted set of Bowden brake cables for Miles Monarch or Whitney Straight.
KEYSTONE GARAGE,
EXETER ROAD, BOURNEMOUTH. [7062

NUMBER metal and wooden propellers required, suit Gipsy Major engine.—Box 6957. [7059

WANTED, 12-volt T.R.F. set, any type considered, S.T.R.9 preferred.—Flightways, Southampton Airport. [7063

GIPSY MAJOR engine wanted, low hours. Also wind-driven generator.—Keystone Garage, Exeter Road, Bournemouth. [7060

AIRCRAFT SERVICING

F. G. MILES, Ltd., Redhill Aerodrome, Surrey. Tel. Nutfield Ridge 2200.

AN approved design, maintenance and repair organisation staffed by experts on Miles aircraft. Major and minor modifications a speciality; radio installations.

APPROVED instrument test shop; specialists in race preparations.

F. G. MILES, Ltd., Redhill Aerodrome, Surrey. Tel.: Nutfield Ridge 2200. [3034

BROOKLANDS AVIATION, Ltd., Brooklands Aerodrome, Weybridge. C. of A. overhauls, modifications and conversions. Tel.: Byfleet 420. [3035

REPAIRS and C. of A. overhaul for all types of aircraft. Brooklands Aviation, Ltd., Civil Repair Service, Sywell Aerodrome, Northampton. Tel.: Moulton 3351. [3037

CARAVANS

A CARAVAN REPUTATION TO LOSE.

U.K.'s largest caravan distributor obviously dare not sell anything but the best vans or try to get out of his unique free-van-lent-for-a-leaky-one guarantee of U.K.'s largest selection. So why not buy where you are safe, or at least send for 1 lb. of free advice articles and brochures to Taplow, please. Good h.p. terms too. A. S. Jenkinson, Ltd. (our larger selection in winter time—London Branch), 60 Oxford Street, London, W.1 (corner Rathbone Place). Tel.: Langham 2676/7. Two minutes from Tottenham Court Road Tube Station. Open till 8 p.m. seven days a week. Also at Bath Road, Taplow, Bucks. Tel.: Maidenhead 1854/5. Always open. Easy to reach—right on Main A4. Outskirts Maidenhead. Taplow Station 4 mins. And opening March 3rd, Hammersmith Branch, corner of Sussex Place and Hammersmith Bridge Road, S.W.6. One minute Hammersmith Broadway. [3046

NEW "Statesman." £1,095. Other Berkeleys from £200/10/-. New Glider 4-berth de luxe, £288/10/-, and 2-berth, £212. Safari, £202. Towing. Hire purchase.—Mantles Garages, Ltd., Biggleswade. Tel. 2213. [3067

CLOTHING

R.A.F. and R.N. officers' uniforms purchased; large selection of R.A.F. officers' kit for sale, new and reconditioned.—Fleming Service Outfitters, 48-49, Wellington Street, Woolwich. Tel.: Woolwich 1068. [3067

CLUBS

REDHILL FLYING CLUB.

LEARN to fly at Redhill Aerodrome, Surrey. South London's nearest flying centre, 23 miles from Hyde Park Corner. Flying per hour dual: from £2/10/- and instrument flying, instructors' and advanced courses. Attractive clubhouse with full catering facilities.—Tel.: Nutfield Ridge 2200. [3047

HEARTS AND ESSEX AERO CLUB, Broxbourne Aerodrome, Nazeing, Essex. M.A.C. approved 30-hour course; solo flying from 5hr per hour; residential: trial lessons 25/-; train from Liverpool Street, or Green Line Coach 715.—Tel.: Hoddesdon 2052, 2431, 3706. [3030

PLYMOUTH AND DISTRICT AERO CLUB for Auster J. and Tiger Moth flying instruction; dual and solo at £3 per hour, reducing to less than £2 per hour for solo flying on "Fly Yourself Hire" basis; flying instructors' courses and M.C.A. approved course for private pilot's licence.—Tel.: Plymouth 72793. [3041

CONSULTANTS

WING COMMANDER R. H. STOCKEN, F.R.Ae.S., Eagle House, 109, Jermyn St., London, S.W.1. Tel.: Whitehall 8033. [3419

HOTELS AND ACCOMMODATION

A HOTEL "permeated with the atmosphere of happiness, courtesy and willing service." Adjoining sandy beach. Children's nursery. Cocktail bar. Dancing. Five to 11 gns. inclusive. Brochure with pleasure.—Chalet Hotel and Country Club, Winterton-on-Sea, Norfolk. [7013

INSURANCE

ALL types of aircraft insurance and personal accident cover.—Apply to J. W. T. Amey, Messrs. R. J. Mosat and Co., Percy House, 79e, High Rd., Tottenham, N.17. Tel.: Tottenham 2003-4-5. [3024

PACKING AND SHIPPING

R. AND J. PARKS, Ltd., 163-9, Fenchurch St., E.C. Tel.: Mansion House 3063. Official packers and shippers to the aircraft industry. [3023

PHOTOGRAPHY

FAIRCHILD aircraft cameras, brand new, K 24, K 20, K 19 EKA-B.—E. and W.S. Co., 60, Church Road, Mossley, Birmingham. [7020

TUITION

LOUGHBOROUGH COLLEGE
LEICESTERSHIRE, ENGLAND.
COURSES IN ENGINEERING AND SCIENCE

FULL-TIME courses leading to diploma and/or degree in Mechanical, Civil, Electrical, Aeronautical, Automobile and Chemical Engineering, Chemistry and Physics. The College maintains its own workshops, electrical generating station and aerodrome. Students spend alternate weeks in the lecture rooms, laboratories and productive engineering workshops.

THE College is fully residential and offers accommodation to over 700 students in modern residential halls. Recreational facilities include 120 acres of athletic grounds, gymnasia, sports hall, indoor and outdoor swimming pools, and stadium.

FOR prospectus giving full details, apply to the Registrar. [7032

TUITION

SOUTHEND MUNICIPAL FLYING SCHOOL.

SOUTHEND-ON-SEA, Essex. Tel.: Rochford 54034. Private and commercial licences from £5 per hour or on contract from £3 per hour on Auster aircraft. Full night-flying facilities. Aircraft fitted with radio. No entrance fee, no subscription.—Write for full particulars. [0332

LONDON SCHOOL OF AIR NAVIGATION (1940), Ltd.

PERSONAL coaching for Commercial Instrument Rating, Senior Commercial, A.L.T.P. (conversion thereto) and Flight Navigator licences. This school provides the most rapid and economical method of qualifying. I.C.A.O. standards.

COMPLETE "Study-as-you-work" courses. Simulates classroom instruction: lessons, questions, model answers. Unique in application, ideal those employed or seeking career from Services.

LINK instruction and R/T for all Instrument Rating procedures. Any form of flying training at best quotations.—Brochure with terms: 6-10 King Street, London, W.6. Tel.: RIV. 7400. [0277

LEARN to fly for £96; instructors' licences and instrument flying to £5 an hour; night flying £5-10- an hour; residence 6 gns. weekly. Approved M.C.A. private pilot's licence course.—Wiltshire School of Flying Ltd., Thruxton Aerodrome, Andover, Hants. [0283

A.F.R.Ae.S., A.S.I. Certs., A.M.I.Mech.E., etc., on "no pass, no fee" terms; over 95% successes. For details of exams. and courses in all branches of aeronautical work, navigation, mechanical eng., etc., write for 144-page handbook free.—B.I.E.T. (Dept. 76B), 17, Stratford Place, London, W.1. [0707

FREE! Brochure giving details of courses in all branches of aero eng. covering A.F.R.Ae.S., M.C.A., exams., etc. We are the only postal training college operated by an industrial organisation.—Write to E.M.I. Institutes, Postal Division, Dept. F36, 43 Grove Park Road, London, W.4. Tel.: Chiswick 4417. (Associated with H.M.V.) [0026

SCHOOL OF NAVIGATION, University College, Warsash, Southampton. Flight navigator's course £16/10/- for six months' tuition; pilot licences, £7/10/- to £13/10/- for six months' tuition; Link instruction; all approach systems, 10/- per hour or £3/10/- for ten hours; postal course; hall of residence. Tel.: Locks Heath 2261. [0767

COLLEGE OF AERONAUTICAL AND AUTOMOBILE ENGINEERING, Chelsea and Redhill Aerodrome. Diploma course in aeronautical engineering combine full day workshop and technical training with coaching for R.Ae.S. Associate Fellowship examination. Parts I and II aircraft engineers, licences, etc., in preparation for executive positions. Syllabus from the College Secretary, Sydney Street, Chelsea, S.W.3. Tel.: Flaxman 0081. [0019

MARSHALL'S FLYING SCHOOL OF CAMBRIDGE. M.C.C.A. approved courses (30 hours) for the private pilot's licence on Tiger Moth or Auster aircraft at £5 per hour; flying training for the commercial pilot's licence and instructor's endorsement, aircraft also available for aerial photography and air charter, no entrance fees or subscriptions.—The Airport, Cambridge. Tel. 54281 (ext. 3). [0648

SITUATIONS VACANT

THE DE HAVILLAND AIRCRAFT CO., LTD.,

HAVE VACANCIES FOR

SENIOR DESIGN AND INTERMEDIATE DRAUGHTSMEN

PREFERABLY WITH AIRCRAFT EXPERIENCE IN THEIR HATFIELD AND LONDON (REGENT STREET) OFFICES

Applications, stating age, experience and salary required to

CHIEF DRAUGHTSMAN

THE DE HAVILLAND AIRCRAFT CO., LTD.,

HATFIELD, HERTS [0031

CITY AND COUNTY OF NEWCASTLE-UPON-TYNE

APPOINTMENT OF AIRPORT MANAGER

THE Council of the City and County of Newcastle-upon-Tyne invite applications from persons with suitable experience for the post of manager of the Council's airport, situate at Woolsington.

THE salary payable will be in accordance with Grade X of the scale of salaries fixed by the National Joint Council for Local Authorities Administrative, Professional, Technical and Clerical Services (£870x30-£1,000), and the appointment will be subject to the conditions set forth in the scheme of that Joint Council.

FURTHER particulars of the duties attaching to the office may be obtained from the undersigned on written application being made and all applications must be received not later than February 25th, 1952.

JOHN ATKINSON,
Town Clerk.

Town Hall,
Newcastle-upon-Tyne, 1. [7647

DRAUGHTSMEN

SENIOR, INTERMEDIATE AND JUNIOR (OVER 23)

required by

SHORT BROS. AND HARLAND, LTD.

IN THEIR AIRCRAFT DRAWING OFFICE, BELFAST

(preferably with aircraft experience).

Applications, stating age, experience and salary required, to:

CHIEF DRAUGHTSMAN,

SHORT BROS. AND HARLAND, LTD.

QUEEN'S ISLAND, BELFAST. [7613

JUNIOR DEVELOPMENT ENGINEERS

FOR WORK ON STRUCTURE, ELECTRO-HYDRAULIC ACCESSORIES OR HYDRAULICS

required on work of national importance. Applicants should preferably be of degree standard, but those having some experience on the above lines would be acceptable.

PLEASE apply in writing, giving full details, to the

PERSONNEL MANAGER,

DE HAVILLAND PROPELLERS, LTD.,

MANOR ROAD, HATFIELD, HERTS. [7606

ROLLASON'S

AIRCRAFT SALES

QUOTATIONS MADE IMMEDIATELY FOR THE BEST AVAILABLE AUSTERS, TIGER MOTHS, MAGISTERS, MOTH MINORS, PROCTORS, RAPIDES, CONSULS, DOVES, DAKOTAS, COMMANDOS, ETC.

THIS WEEK'S SPECIALITY

TWO D.H. TIGER MOTHS, WITH POSITIVELY THE LOWEST AIRFRAME HOURS EVER OFFERED.

No. 1 Airframe: 4.05 hours since new.
Engine: 128.00 ,, ,, ,,
No. 2 Airframe: 3.35 ,, ,, ,,
Engine: 183.00 ,, ,, ,,

BOTH IN IMMACULATE CONDITION WITH 12 MONTHS C. of A. DELIVERY 2 WEEKS. £407 10s. Each, ex-works.

GROUND EQUIPMENT

BATTERY STARTERS, HYDRAULIC JACKS, SCREW JACKS, TRESTLES, SPRAY PLANT EQUIPMENT, COMPRESSORS, ELECTRIC AND PETROL, etc., AND MISCELLANEOUS TEST EQUIPMENT.

SPARES

IF YOUR REQUIREMENT DOES NOT APPEAR IN OUR LISTS, WE PROBABLY STILL HAVE IT!

Just Write to :-

W. A. ROLLASON LTD.
CROYDON AIRPORT, SURREY

Telephone: CROYDON 5151/4 Cables: ROLLAIR: CROYDON

Aero & Jig & Tool Draughtsmen in Great Demand

MEN & YOUTHS

There is an insatiable demand for Aero, Jig and Tools, etc., Draughtsmen and Inspectors.

So acute is the present shortage that employers are only too anxious to engage those with no previous practical experience who are able to prepare neat and accurate drawings.

QUALIFY AT HOME—IN SPARE TIME

After brief, intensely interesting study—undertaken at home in your spare time—*YOU* can secure an attractive and interesting post as **Aero-Draughtsman.** Numerous vacancies are also available in **Electrical, Mechanical, Plastics,** etc., branches of Draughtsmanship.

FREE GUIDE

The Free Guide contains 132 pages of information of the greatest importance to those seeking such success compelling qualifications as **A.M.I.Mech. E., A.F.R.Ae.S., A.M.I.P.E., A.M.I.M.T., Gen. Cert. of Educ., and B.Sc.,** etc., also **R.A.F. Entry** (Maths., etc.), together with particulars of our remarkable Guarantee of

SUCCESS—OR NO FEE

Write now for your copy of this remarkable publication. It may well prove to be the turning point in your career.

NATIONAL INSTITUTE OF ENGINEERING

(Dept. 437), 148-150, HOLBORN, E.C.1
(*South Africa Branch E.C.S.A., P.O. Box 9417, Johannesburg*).

SITUATIONS VACANT

NAVAL AVIATION

YOUNG men between 17 years and 24 years are required for short service commissions in the ROYAL NAVY for eight years' flying duty as pilots or observers. It is intended that up to 30 per cent of those completing the engagement shall, if suitable, be given permanent commissions. The remainder will pass to the Reserve for seven years and be paid a tax-free gratuity of £1,500. Applicants must have School Certificate with a pass in mathematics or a General Certificate of Education with passes at ordinary level in English language, mathematics and one other subject, all taken at the one sitting, or equivalent educational qualifications, and be physically fit.

Write to Secretary of the Admiralty (C.W.320 F.), Queen Anne's Mansions, London, S.W.1. [7635

CROWN AGENTS FOR THE COLONIES

A R pilot required by the Falkland Islands Government for a tour of one year with option of extension to three years. Salary £720 rising to £840 a year. Free passages. Liberal leave on full salary. Candidates under 30 years of age, must hold a pilot's commercial licence and should have had experience of Norseman and Auster float planes.—Apply at once, by letter, stating age, full names in block letters, and full particulars of qualifications and experience, and mentioning this paper, to the Crown Agents for the Colonies, 4 Millbank, London S.W.1, quoting on letter M.27942/E. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. [7651

THE DE HAVILLAND AIRCRAFT Co., Ltd., Christchurch, Hampshire, have vacancies for the following personnel:—

SENIOR AERODYNAMICISTS
JUNIOR AERODYNAMICISTS
FLIGHT TEST OBSERVERS
SENIOR WEIGHT CONTROL ENGINEERS
JUNIOR WEIGHT CONTROL ENGINEERS

APPLY in writing, stating age, experience, and salary required, to Personnel Manager, at the above address. [7630

NORMALAIR, Ltd., Yeovil, Somerset, require:—

TECHNICAL ASSISTANTS

TECHNICAL CLERKS

TECHNICAL WRITERS

FOR design development, etc., of aircraft air conditioning and high altitude breathing equipment.

APPLY, giving age, experience, qualifications and salary required, to Personnel Officer.

LOCAL interviews arranged for selected applicants. [7511

THE DE HAVILLAND AIRCRAFT Co., Ltd., Christchurch Hampshire, have vacancies for the following:—

SENIOR method engineers with experience in machine shop, sheet metal or fitting shop.

SENIOR and junior jig and tool draughtsmen, preferably with experience of assembly jigs as well as small tools.

APPLY in writing to the Personnel Manager, stating age, experience and salary required. [7625

YOUNG, keen draughtsmen wanted for aircraft structural work.

TILTMAN LANGLEY LABORATORIES, Redhill Aerodrome, Surrey. [7631

AIRCRAFT or mechanical draughtsmen required, all grades, for appointment at Langley Offices.—Apply in first instance, stating age, experience and salary required, to:—

THE Chief Draughtsman, Alan Muntz and Co., Ltd. (Aircraft Section), Heston Airport, Hounslow, Middlesex. [0030

JIG and tool draughtsmen required, fully experienced. —Applications, in writing, to Personnel Manager, Percival Aircraft, Ltd., Luton Airport, Beds., stating age, experience and salary required. [0032

EXPERIENCED radio engineer and radio mechanics at our base at Stansted Airport, Essex.—Apply by letter or telephone, to the Senior Radio Engineer, Aviation Traders Ltd., Southend Airport, Essex. Tel.: Rochford 54081. [0050

FLYING instructors required for service in North of England. Applicants must have a minimum of R.A.F. B.I. category and no radio training experience. Salary £750-£1,050 p.a.—Apply: Box 6838. [7636

APPLICATIONS are invited from design draughtsmen and stressmen; also technical assistants with combined design and performance experience for work on both reciprocating and gas turbine aero engines.

APPLICATIONS should state full particulars of experience and qualifications, and should be addressed to The Personnel Manager, The de Havilland Engine Co., Ltd., Stonegrove, Edgware, Middx. [0075

DEVELOPMENT engineers with experience on problems involving thermodynamic and mechanical considerations, for work on aircraft heating installations.—Write, stating details of age, training and experience, to Box 6726. [7667

A TECHNICAL assistant required for interesting and varied work in modern test laboratory of heat exchange equipment. Age 23-28.—Please apply in writing, stating age, experience and qualifications, to Secretary, Delaney Gallay, Ltd., Cricklewood, N.W.2. [7604

AIRCRAFT fitter assemblers required by de Havilland Aircraft Co., Hatfield. Good working conditions, modern equipment, superannuation scheme, opportunities for advancement.—Apply in person or by letter to Personnel Manager, or telephone Hatfield 2361. [0039

TECHNICAL authors and illustrators required. Knowledge of M.o.S. procedure desirable.—Applications, in writing, stating age, experience and salary required to Personnel Manager, Percival Aircraft, Ltd., Luton Airport, Beds. [0034

CHIEF instructor/assistant airport manager required in the West of England. Commercial licence and full G.A.P.A.N. endorsement must be held or be easily obtainable. Salary £900 to £1,000 p.a. Pension scheme.—Box 6667. [7624

WEIGHT estimator required for work on fixed wing and helicopter aircraft.—Apply, giving details of age, qualifications, experience and salary required to: Personnel Manager, Percival Aircraft, Ltd., The Airport, Luton, Beds. [0033

JUNIOR aerodynamicist required. Preferably with H Higher National Certificate and with some previous experience in simillarcapac ity.—Applications, in writing, to Personnel Manager, Percival Aircraft, Ltd., Luton Airport, Beds., stating age, experience and salary required. [0054

SITUATIONS VACANT

LINK Trainer instructor and Link Trainer operator required for employment in the Home Counties. Applicants should have had R.A.F. experience.—Apply: Chief Instructor, No. 1 R.F.T.S., R.A.F. Station, Booker, near High Wycombe, Bucks. [7697]

SENIOR and junior weight engineers required. Interesting work on new projects. Permanent positions offered to suitable applicants.—Apply, stating age, experience, qualifications and salary required, to Chief Designer, Gloster Aircraft Co., Ltd., Witcombe, Glos. [7612]

TECHNICAL illustrator required to prepare service manuals for aeroplane landing gear and hydraulic units. Youth and comparative inexperience not a disadvantage if compensated for by interest and a knowledge of projection.

WRITE personally to Mr. J. B. Smith, Chief, Publicity Department, British Messier, Ltd., Cheltenham Road East, Gloucester. [7603]

REQUIRED for service abroad, "A"- and "C"-licensed engineers endorsed for Dove and Queen 70; also "C"-licensed propeller engineer. Good salary and allowances, and excellent home leave.—Apply: Airwork, Ltd., Overseas Division, Sutton Lane, Langley, Bucks. [7610]

GLOSTER AIRCRAFT Co., Ltd., have vacancies for fully experienced aircraft structural and electrical draughtsmen.—Applications, in writing, stating age, experience and salary required, to Employment Officer, Gloster Aircraft Co., Ltd., Hucclecote, Glos. [7610]

VACANCIES for draughtsmen and stressmen exist in the Saunders-Roe Helicopter Division at Eastleigh, near Southampton.—Interested persons should apply, stating age, experience, qualifications, salary required, etc., to the Personnel Officer, Saunders-Roe, Ltd., East Cowes, Isle of Wight. [7600]

AIRWORK GENERAL TRADING Co., Ltd., Blackbushe Airport, near Camberley, Surrey, urgently requires engine fitters, electricians and instrument mechanics for maintenance of Viking, Dakota and Hermes aircraft. Rate 2/7d. per hour for 44-hour week, plus overtime. Canteen facilities available.

ALSO required are licensed aircraft engineers with experience on Hermes aircraft and radio mechanics holding current "M" licences. Pay according to qualifications.

APPLICATIONS, in person or in writing, to the Service Manager. [7646]

APPLICATIONS are invited from senior and intermediate design draughtsmen; experience of aero-engine design desirable but not essential.—Please write, stating age and giving details of previous experience in chronological order, to the Personnel Officer, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middx. [7649]

PLANNING engineers (aircraft) required. Considerable production planning experience and sound knowledge of metal airframe components manufacture essential. Applications in writing to Personnel Manager, Percival Aircraft, Ltd., Luton Airport, Beds, stating age, experience and salary required. [7626]

THE FAIREY AVIATION Co., Ltd., require a number of senior aerodynamicists for varied work on all types of aircraft. The prospects of advancement are good for capable applicants.—Full details of previous career, qualifications, salary, etc., to the Personnel Manager, Hayes, Middlesex, quoting reference AL/1. [7654]

SENIOR test engineers, of at least A.M.I.Mech.E. Certificate standard, required for the development of aircraft hydraulic systems and components.—Write, giving details of age, experience and salary required, to the Chief Test Engineer, British Messier, Ltd., Cheltenham Road East, Gloucester. [7617]

ONE male test laboratory assistant required. National Certificate standard and preferably 2-3 years' experience on design and analysis of mechanical tests.—Applications, in writing, stating age, experience and salary required, to Personnel Manager, Percival Aircraft, Ltd., The Airport, Luton, Beds. [7597]

H. M. HOBSON, Ltd., invite applications for positions in the drawing office as follows: designers, detail and modification draughtsmen, checkers, stressmen, all of whom is concerned with interesting projects connected with fuel metering equipment and hydraulic flying controls for aircraft.—Hobson Works, Portcheston, Wolverhampton. [7642]

EXPERIENCED stressman required for responsible position in stress office. Minimum requirements B.Sc. (or equivalent), several years' experience, ability to take charge of stressing of complete aircraft.—Applications, in writing, to Personnel Manager, Percival Aircraft, Ltd., The Airport, Luton, Beds, giving details of training, experience, age and salary required. [7625]

IMPORTANT Midlands aircraft engine manufacturer has vacancies for a number of designers and senior and junior draughtsmen. The work is connected with gas turbine engines. Although experience is most advantageous it is not necessarily essential, as training will be given.—Apply in some detail, please, to Armstrong Siddeley Motors, Ltd., Reference 301L, Coventry. [7618]

DRAUGHTSMEN are required by a well-known engineering company for employment in the London area. There are vacancies for men to work on servo engine detailing and design, test plant design and gas turbine blade design. These are permanent pensionable positions carrying good salaries and prospects.—Applications quoting AEE to Box 6869. [7643]

AIR FORCE, Naval, civil and helicopter aircraft all under design and development at Percival Aircraft, Ltd. Applications are invited from senior and junior draughtsmen, and stressmen for work on this interesting programme.—Write, giving details of experience and salary required, to Personnel Manager, Percival Aircraft, Ltd., Luton Airport, Luton, Beds. [6995]

TECHNICAL assistants for analysis of engine test results and performance calculation are required by a well-known aero-engine firm for employment in the London area. The minimum qualifications for these positions are: apprenticeship or three years' experience of I.C. engines and O.N.C.—Please write, giving full details, mentioning Ref. DEE, to Box 6518. [7604]

THE GLOSTER AIRCRAFT Co. requires senior and intermediate stressmen to work on projects and aspects of advanced interest. Excellent prospects of advancement for sound and energetic men.—Apply, in the first instance, giving full particulars of technical qualifications, experience and salary required, to The Chief Designer, Gloster Aircraft Co, Ltd., Hucclecote, Glos. [6911]

EXPERIENCED aerodynamicist required for responsible position in aerodynamics department. Minimum requirements B.Sc. (or equivalent), several years' experience, ability to undertake all normal performance, stability and other aerodynamic work.—Applications, in writing, to Personnel Manager, Percival Aircraft, Ltd., The Airport, Luton, Beds, giving details of training, experience, age and salary required. [6956]

BRITISH EUROPEAN AIRWAYS require a technical publications assistant at their Renfrew base. Experience of preparation of information for publication, a knowledge of aircraft construction (particularly Dakota and D.H.89 spares and stores and an ability to read engineering drawings are required. Salary scale £9 7s. 6d. to £10 12s. 6d. per week.—Apply, in writing, to Base Personnel Officer, B.E.A., Airport For Glasgow, Renfrew. [7662]

THE
DE HAVILLAND
ENGINE COMPANY LIMITED
have vacancies in their
DESIGN OFFICE at STAG LANE
for
SENIOR DESIGNERS
& DRAUGHTSMEN
for work on Gas Turbine development and other projects
GOOD SALARIES & PROSPECTS
for suitable applicants
SUPERANNUATION SCHEME
Apply giving details of previous experience and salary required
to
THE PERSONNEL OFFICER
STAG LANE, EDGWARE
MIDDLESEX

DAKOTA SPARES
Undercarriages—all parts available.
Wheels complete.
Exhaust Collecter Rings complete.
Exhaust Tail Pipes, Brake Drums.
All for immediate delivery ex stock.
Staravia
BLACKBUSHE AIRPORT
CAMBERLEY, SURREY
Tel.: Camberley 1600

RATCHET & REVOLUTION COUNTER
Speeds up to 6,000 R.P.M.

Please send for Leaflet No. 18/7
Sole Makers and Patentees
R. & F. CARTER & CO., LTD., BOLTON, 6
MEMBERS OF S.B.A.C. ORGANISATION

SITUATIONS VACANT

BRITISH OVERSEAS AIRWAYS CORPORATION has vacancies for pilots below age 35, preference being given to younger applicants. Minimum qualifications: commercial pilot's licence and instrument rating. Normal commencing salary between £615 to £905 p.a., but in exceptional cases this may be £1,095 p.a.—Applications should be addressed to Chief Personnel Officer, B.O.A.C. Airways House, Great West Road, Brentford, Middx. [7660]

HANDLEY PAGE (Reading), Ltd. The Aerodrome, Woodley, Reading, have a vacancy in their Design Office for a senior stressman with good experience and a degree or Higher National Certificate with endorsements in aeronautical subjects. Also required is a qualified weights control engineer to take charge of small weights section.—Please send full particulars to the Personnel Officer. [7674]

SUPERSONIC tunnel technicians required by aircraft firm in the Midlands for construction and operation of a 7,500 h.p. supersonic wind tunnel. Vacancies exist for aerodynamicists, draughtsmen-designers and mechanical engineers; a degree in engineering would be preferred (Higher National in the case of draughtsmen-designers).—Apply, stating age, experience and qualifications, to Box 6887. [7637]

TECHNICAL assistants, both junior and senior, required in mechanical engineering department for work of national importance in connection with development of gas turbine engines. Excellent prospects exist in sections dealing with rig test of engine components, vibration, static structure test and research in gears and bearings. Qualifications: degree or H.N.C.—Apply: Reference No. VI, Armstrong Siddeley Motors, Ltd., Coventry. [7666]

NORMALAIR, Ltd., Yeovil, Somerset, require first-class designers and development engineers for work on aircraft pressurising, air conditioning and high altitude breathing equipment. H.N.C. or its equivalent is minimum standard acceptable and applicants who should preferably have experience in light precision or instrument engineering, must apply, giving age, experience, qualifications and salary required to Personnel Officer. Selected applicants interviewed locally where convenient. [7588]

MANAGER required for sub-contract department in large aircraft factory in south-west to control nation-wide sub-contracting of all types of machining, sheet metal and assembly work. Sound engineering training, previous experience in aircraft sub-contracting, and ability to organise and control staff are essential qualifications. Good salary and prospects for suitable man.—Write Box L4627, A.K. Advg., 12a Shaftesbury Avenue, London, W.C.2. [7638]

THE GLOSTER AIRCRAFT Co. requires the services of a number of aerodynamicists, (a) for design and project work, and (b) for flight test reduction. Opportunity exists for individuals to vary their experience within the Aerodynamics Department. Candidates with some years' experience preferred, but applications from juniors with sound mathematical ability will receive full consideration. —Apply, in the first instance, giving full particulars of age, experience and salary required, to The Chief Designer, Gloster Aircraft Co., Ltd., Hucclecote, Glos. [7615]

THE following are required for an expanding programme of new work on aircraft design: Three assistant chief men with experience of light alloy construction; one section leader design draughtsman for engine, fuel system and equipment installation work; one leading draughtsman for modification work; one senior draughtsman to be responsible for dealing with works queries; one senior weight estimator capable of estimating project weights; one technical author for civil and military handbooks.

ALL the above personnel, with the exception of the technical author, should preferably hold at least the Higher National Certificate in Engineering, but consideration will be given to other applicants with lower qualifications.—Applications for all posts should be made in writing, stating age, experience, qualifications, salary expected and details of the type of accommodation which would be required in the Leicester area. All applications to Chief Designer, Auster Aircraft, Ltd., Rearsby Aerodrome, Leicester. [7655]

ASSISTANT to the chief planning engineer required. Applicants must have a sound knowledge of aircraft production methods and the post will also involve statistical work in connection with shop loading. Candidates must have served an engineering apprenticeship and have received some technical education, preferably to H.N.C. standard. They must also have had experience of work in aircraft planning and rate-fixing.—Applications should be made to the Personnel Manager, Folland Aircraft, Ltd., Hamble, Southampton. [7644]

BRITISH EUROPEAN AIRWAYS have vacancies for flight simulator maintenance engineers. Duties include overhaul and maintenance of electronically operated flight simulators at London Airport. Applicants should possess thorough knowledge of electronics and have had maintenance experience on apparatus using servo-mechanisms actuating repeater instruments. Flying experience and knowledge of radio systems an advantage. Salary scale: £11/5/- to £13/10/-.—Write to Personnel Officer, Flight Operations Department, B.E.A., Keyline House, Ruislip, Middx. [7664]

SENIOR technical assistant required for the Service Department of the de Havilland Engine Co. Ltd., preferably with experience on reciprocating and gas turbine engines. Suitable applicants will be required to work on headquarter's staff of the Service Department at Leavesden Aerodrome, near Watford, Herts.—Apply, in writing, stating age, qualifications and salary required, to the Personnel Manager, The de Havilland Engine Co. Ltd., Leavesden Aerodrome, near Watford, Herts. [7661]

SITUATIONS WANTED

AIRLINE Link instructor, 3 yrs. exp., free April. Danish speaker. Box 6908. [7650]

SAFETY equipment worker (parachutes and dinghies), seeks post with flying school or charter company. Aged 30, 10 years' experience, will travel anywhere. Member R.A.F. Reserve.—Richards, 388 Grimshaw Lane, Middleton, Manchester. [7656]

NORWEGIAN, with 20 years' civilian and military aircrew training, seeks short- or long-term employment. Graduate of Staff College and R.A.F. Empire Central Flying School; A2 instructor; A1 medicality; 5,000 hours single and twin.—Box 6881, A/S Noytobil Olsen, Oslo, Norway. [7641]

WANTED

WANTED, hangar suitable for erection in very exposed area, big enough for 3 Rapides. State price ready for loading.—Box 6885. [7640]

BOOKS, ETC.

493 "AEROPLANES," 407 "Flights," 1904-51. Offers.—Chaplow, 59 Lawn Road, Eastleigh, Hants. [7658]

THE BRISTOL AEROPLANE COMPANY LIMITED

require SENIOR AND OTHER DRAUGHTSMEN
including Designers and Mechanical Engineering Draughtsmen for Aircraft work at their Filton and London Drawing Offices

MECHANICAL ENGINEERING DRAUGHTSMEN
are also required at Filton for armament design work
Experience of light mechanisms particularly suitable

•

APPLICANTS SHOULD PREFERABLY HAVE NATIONAL OR HIGHER NATIONAL CERTIFICATES

•

Apply in writing, giving full details of experience, age, etc. to:—
THE PERSONNEL MANAGER, THE BRISTOL AEROPLANE COMPANY LIMITED
(AIRCRAFT DIVISION) · FILTON HOUSE · BRISTOL

The . . . .
British Air Line Pilots' Association
9-10 MARBLE ARCH, W.1
Tel.: AMBassador 1337

Membership open to all Commercial and Service pilots. For full details as to the objects and particulars of Membership please write to Secretary.

R.A.F. OFFICERS
UNIFORMS
NEW AND RECONDITIONED
LARGE SELECTION IN STOCK
FISHERS, 86/88 WELLINGTON ST., WOOLWICH, S.E.18 'PHONE: 1055

AIRCRAFT SPRING WASHERS

CROSS MFG. (1938) LTD., COMBE DOWN, BATH

THE OLD ESTABLISHED
AIRCRAFT FURNISHING SPECIALISTS

RUMBOLD

L. A. RUMBOLD & Co. LTD.
KILBURN, LONDON, N.W.6

A.I.D. & A.R.B. APPROVED STOCKISTS
of all types of
AIRCRAFT INSTRUMENTS
Also
AIRCRAFT ELECTRICAL ACCESSORIES
Immediate delivery in quantities

WYNN

E. D. WYNN & CO.
STAVERTON AERODROME
CHELTENHAM RD · GLOUCESTER
Phone: Churchdown 3264 (3 lines) *Grams: "Wynn, Gloucester"*

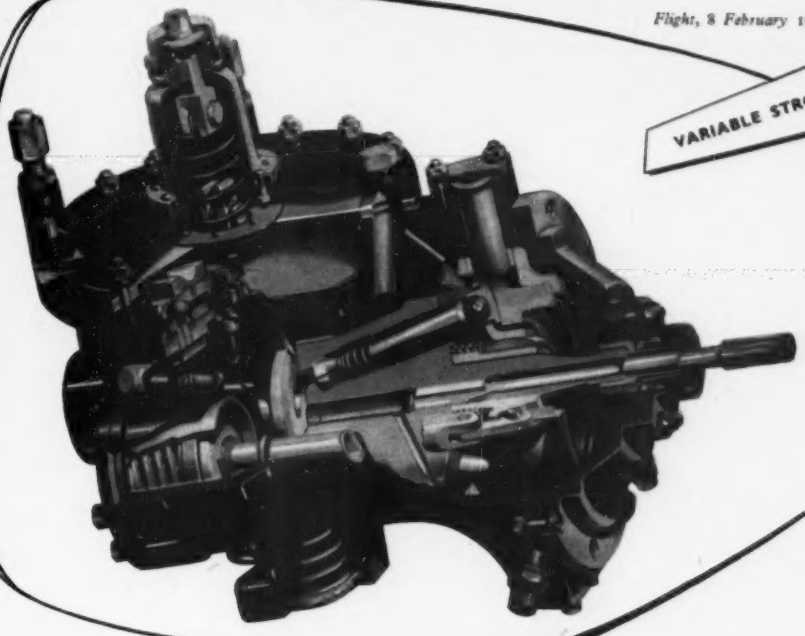
ATTEWELL
FOR
LAMINATED ALUMINIUM

Extensively used on all Important Aircraft

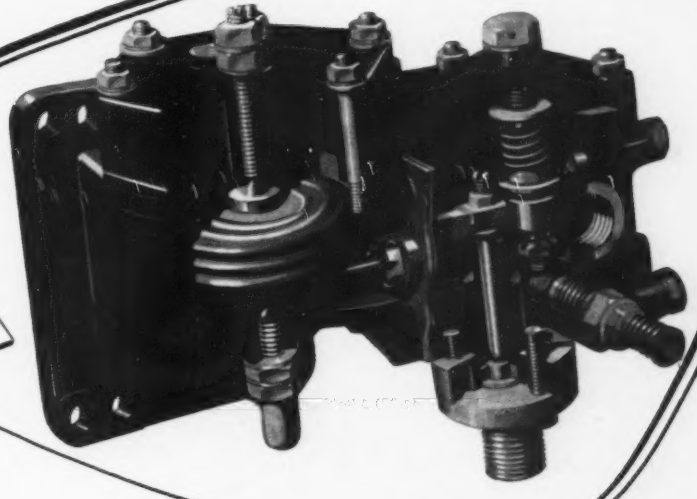
Write for Catalogue and Prices
B. ATTEWELL & SONS, LTD.
Sole Distributors and Stampers
REFLECTION WORKS, SOUTHALL, MIDDLESEX
'Grams: Reflection, Southall. *Phones:* Southall 2888 & 3555

Printed in Great Britain for the Publishers, ILIFFE & SONS LTD., Dorset House, Stamford Street, London, S.E.1, by SUN PRINTERS LTD., London, and Watford, Herts. Flight can be obtained abroad from the following: AUSTRALIA AND NEW ZEALAND: Gordon & Gotch, Ltd. INDIA: A. H. Wheeler & Co. CANADA: The Wm. Dawson Subscription Service, Ltd.; Gordon & Gotch, Ltd. SOUTH AFRICA: Central News Agency, Ltd.; Wm. Dawson & Sons (S.A.), Ltd. UNITED STATES: The International News Co. Entered as Second Class Matter at the New York, U.S.A., Post Office.

VARIABLE STROKE FUEL PUMP



BAROMETRIC CONTROL



The pump will deliver petrol at 750 g.p.h. (maximum). Its stroke is varied by a hydraulic servo which is responsive to any required signal, thus giving complete control with rapid response in output. The barometric control maintains correct pump delivery pressure in accordance with variation in altitude and forward speed.

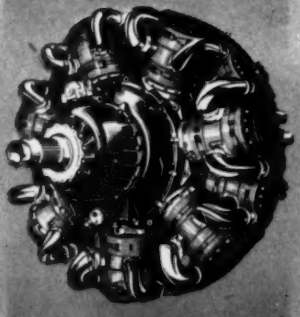
FUEL AND COMBUSTION SYSTEMS FOR GAS TURBINE ENGINES

JOSEPH LUCAS (Gas Turbine Equipment) LIMITED, BIRMINGHAM AND BURNLEY, ENGLAND

To prove that there is no foreseeable limit to the life of "Bristol" Hercules engines, a type test has just been carried out on a Hercules 634, built from a miscellaneous collection of old components most of which had already done over 3000 hours of service. Powers, fuel and oil consumptions were within the limits for a new engine. The Hercules 634 engine delivers 1690 B.H.P. for take-off, and is used in the Vickers "Viking" airliner. It has established beyond dispute the reputation of being one of the most reliable engines in the world.

The Hercules 634 being removed from the dynamometer at the completion of this type test.

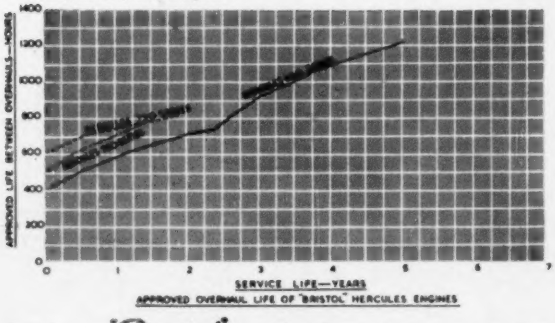
AN UNUSUAL TYPE TEST



MORE HERCULES ACHIEVEMENTS

OVERHAUL LIFE EXTENDED TO 1200 HOURS

Graph shows rate of increase of overhaul life of Hercules engines.



APPROVED OVERHAUL LIFE OF "BRISTOL" HERCULES ENGINES

The period between overhauls of the Hercules 634 engines in Vikings operated by Airwork Ltd. has now been officially extended to 1200 hours, following the highly satisfactory condition of a trial batch of engines that had been operated for this period by Airwork. Thus a new step has been taken in the gradual process of extending the period between overhauls. Later marks of Hercules engines are now well on the way to repeating the excellent performance of the Hercules 630 series engines (see graph).

THE Bristol AEROPLANE COMPANY LIMITED · ENGLAND

9912